OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL COVER SHEET
Complete Only Applicable Items

1. QA: QA
Page: 1 of: 33

2. ☒ Analysis ☐ Engineering ☒ Performance Assessment ☐ Scientific	3. ☐ Model ☐ Conceptual Model Documentation ☐ Model Documentation ☐ Model Validation Documentation

4. Title: Groundwater Usage by the Proposed Farming Community

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Initial Issue

Editorial Corrections made after approval:
1) Page count for Attachment V corrected in Block 7 above.
2) DI# and pagination added to Attachments I through VI.

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A CD is included with this document.
The disk contains three Microsoft ® Excel 97 SR-2 files. The details about each file are given below.

***AGE HOUSEHOLD FINAL.XLS**, 17,920 bytes, 10/10/99, 11:40am. This file contained the calculations given in Attachment IV of the age distribution from the 1990 census data and the Household size distribution from the 1990 census data. These calculations are discussed in the document at sections 6.1.1 and 6.1.2 respectively.

***CONSOLIDATED FINAL.XLS**, 142,336 bytes, 11/5/99, 3:33pm. . This file contains the calculations given in Attachment V of the Analysis of Water Usage with the Farms not Consolidated. The calculation is discussed in the document at section 6.2.1 et seq.

***NON CONSOLIDATED FINAL.XLS**, 103,424 bytes, 10/29/99, 12:51 pm. . This file contains the calculations given in Attachment VI of the Analysis of Water Usage with the Farms Consolidated. The calculation is discussed in the document at section 6.2.1.3 et seq.

SIGNATURE ON FILE

The illegible information appearing throughout Attachment II (consisting of superfluous, hand-written notes) does not impact the technical meaning or content of the record. Attachment II is a printout of an existing record, accepted and accessioned under the number MOL.19990329.0141. 29MAR00

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL REVISION RECORD

Complete Only Applicable Items

2. Analysis or Model Title: Groundwater Usage by the Proposed Farming Community

3. Document Identifier (including Rev. No. and Change No., if applicable): ANL-NBS-MD-000006, Rev. 00

4. Revision/Change No.	5. Description of Revision/Change
Revision 00	Initial Issue

CONTENTS

TABLES

1. PURPOSE

The purpose of this analysis is to quantify the annual volume of groundwater used by the farming community containing the critical group. The scenario defining the critical group and the farming community was provided by the DOE in their interim guidance (Dyer 1999). The underlying rational adopted by the DOE in their guidance is presented in the draft of the proposed 10 CFR Part 63 issued for public comment by the NRC (64 FR 8640).

The requirement for determining the annual ground water usage arises as the NRC, in Section VI, Reference Biosphere and Critical Group for Yucca Mountain, of the Supplementary Information (64 FR 8640, p.8645/6), identifies an acceptable approximation to determine radionuclide dilution. This approximation is to derive radionuclide concentration in groundwater by dividing the annual mass of radionuclides crossing the 20-kilometer boundary by the annual volume of water used by the proposed farming community.

Further, in their interim guidance, the DOE (Dyer 1999) at Sec. 114(b) placed the following caveat on any analyses supporting TSPA. "*Account for uncertainties and variabilities in parameter values and provide the technical basis for parameter ranges, probability distributions, or bounding values used in performance assessment*."

The activities described in this report were conducted in accordance with the Work Direction and Planning Document Titled "Assessment of Groundwater Usage by the Average Member of the Critical Group."(CRWMS-M&O 1999b) The stated purpose (Purpose/Objective/Scope) was *"..to provide the RIP code custodian with a justifiable estimate of annual volumetric water usage by the hypothetical community containing the receptor (average member of the critical group) as specified by regulating agencies (currently draft 10CFR63)*".

To accomplish this objective, three tasks were identified during the planning phase. Once effort on this task was initiated it became apparent that the part of the proposed effort in tasks 1 and 2 (*..to predict consumption of locally grown foods and define the irrigation water requirements to grow these crops*) was not necessary. The regulation permits performing the water usage assessment to be performed using current farming practices with the attendant, published, and accepted water withdrawal data. The analyses reported here to determine groundwater usage did not need to consider neither locally grown food nor the consumption habits of the local population. In addition, it was found (Section 6.3) that the volume of domestic water used (including drinking water) was insignificant when compared to agricultural water usage. Thus other than having a common basis of being based on the habits and characteristics of the local population, the water use estimate derived are independent of the effort defining the critical group.

2. QUALITY ASSURANCE

This analysis was prepared in accordance with the Civilian Radioactive Waste Management System (CRWMS) Management and Operating Contractor (M&O) Quality Assurance (QA) program. The information provided in this analysis will be used for evaluating the post-closure performance of the Monitored Geologic Repository (MGR) waste package and engineered

barrier segment. The Performance Assessment Operations (PAO) responsible manager has evaluated the technical document development activity in accordance with QAP-2-0 (Rev 5), *Conduct of Activities*. The QAP-2-0 activity evaluation (CRWMS M&O 1999a) has determined that the preparation and review of this technical document is subject to *Quality Assurance Requirements and Description* (DOE 2000) requirements. The effort reported in this AMR was conducted and documented in accordance with AP-3.10Q (Rev 1/ICN 1), *Analyses and Models.* The initial planning was conducted under AP-3.10Q (Rev 0). A work plan was developed, issued, and utilized in the preparation of this document (CRWMS M&O 1999b). Since the analysis does not involve any field activity, there is no determination of importance evaluation developed in accordance with NLP-2-0 (Rev 5), *Determination of Importance Evaluations*. There are no permanent items addressed in this AMR, so it is not subject to QAP-2-3 (Rev 10) Classification of Permanent Items.

3. COMPUTER SOFTWARE AND MODEL USAGE

No models were used or developed in this analysis. The only software used was an industry standard spreadsheet (Microsoft Excel). This spreadsheet was used as an aid in calculation; no routine, macros, or other application were developed or used. Use of this software in this manner is excepted from the requirements in AP-SI.1Q, *Software Management*.

4. INPUTS

Inputs to the analysis reported here consist of data from the federal government, the State of Nevada, and the CRWMS M&O. Criteria were obtained from the guidance from the DOE (Dyer 1999), and the Federal Register carrying the proposed rule, 10 CFR Part 63, issued for public comment by the NRC (64 FR 8640).

4.1 DATA AND PARAMETERS

The data used in this analysis are discussed in the following subsections. To comply with the DOE guidance (Dyer 1999) at Sec. 115 (b)(2) the most recent data available at the initiation of this effort was used throughout the analysis.

4.1.1 Groundwater Usage

Groundwater usage for Amargosa Valley in 1997 was taken from data published by the State of Nevada (1997). This report is presented in Attachment II[1]. In the detailed listing in the Attachment, each entry was given a sequential identification number (1 to 132). This number allowed easy cross-referencing during the analysis and helped ensure all data had been entered. These data have been designated accepted data with AMOPE concurrence: OPE:ERC-2085.

[1] Review of the State Water Usage data indicated that the maximum annual irrigation rate assumed used is 5 acre-feet per acre. Any systematic error in this value will propagate through all analyses reported in this AMR. The annual irrigation rate estimated in CRWMS M&O 2000 (Table 3 p. 19) for alfalfa, growing in Amargosa Valley, is more than 7.5 acre-feet per acre. Thus, it can be stated that any systematic error from use of the State published values will be conservative.

4.1.2 Domestic Water Usage

Additional information on domestic water usage was obtained form "Nevada State Water Plan Part 2 – Water Use and Forecasts March 1999, Nevada Division of Water Planning, Department of Conservation and Natural Resources." (State of Nevada 1999, Fig. 5-7). Specifically the value of 208 gallons per day per person was used from Fig. 5-7 under the entry for Nye County (NY) with a caption of "Domestic Self Supplied Water Use/Person 1995 Self Supplied Domestic Use per Person." This existing datum was used in a confirmatory role and as such was not considered an accepted datum or a qualified datum.

4.1.3 Demographics

4.1.3.1 Detailed Demographics 1990

Data defining the population in Amargosa Valley were taken from the 1990 Census (Bureau of the Census 1990). These data are accepted data with AMOPE concurrence: OPE:ERC-2084. A compilation of raw census data that was used in this work is reproduced in Attachment III. Of these data, the items identified in following sub-sections were used.

4.1.3.1.1 Totals

The relevant totals form the census data are provided in Table 1

Table 1. Total Number of People and Households In Amargosa Valley from 1990 Census

Persons	Households
724	236

4.1.3.1.2 Age Distribution

The age distribution from the census data on Amargosa Valley is reproduced in Table 2.

Table 2. Amargosa Valley Population Age Distribution from the 1990 Census

Age	Population
Under 1 year	8
1 & 2 years	26
3 & 4 years	9
5 years	9
6 years	0
7 to 9 years	34
10 & 11 years	48
12 & 13 years	48
14 years	26
15 years	27
16 years	9
17 years	18
18 years	0
19 years	27
20 years	27
21 years	0
22 to 24 years	0
25 to 29 years	43
30 to 34 years	62
35 to 39 years	84
40 to 44 years	43
45 to 49 years	81
50 to 54 years	60
55 to 59 years	27
60 & 61 years	0
62 to 64 years	0
65 to 69 years	0
70 to 74 years	0
75 to 79 years	8
80 to 84 years	0
85 years and over	0
Total	724

4.1.3.1.3 Household size distribution

The household size distribution presented in the 1990 census is reproduced in Table 3.

Table 3. Distribution of Household Size in Amargosa Valley from the 1990 Census

Persons in household	Number of Households with the Defined Number of Persons
1	39
2	79
3	27
4	48
5	16
6	18
7 or more	9

4.1.3.2 Demographics in 1997

As discussed later in section 4.2.2.2, the primary intent of this AMR was to derive annual ground water usage based on a hypothetical farming community comprising of about 15 to 25 farms. However, as further discussed in 4.2.2.1, the hypothetical farming community has approximately 100 residents. The data available to derive water usage estimates can support estimates based on either the number of farms or the number of residents. The primary model is based on farms while the alternative model is based on the number of people (and the number of residences in which they live). The alternative model requires additional input available in the 1990 census. To use the data, the numbers applicable to 1990 have to be scaled to 1997 to accommodate the growth in population of the Amargosa Valley. To scale the 1990 census data to the year for which the most recent water usage data were available (1997), the demographic data applicable to 1997 were taken from Table 2.4.2 (on p. 20) of the "Biosphere" Food Consumption Survey summary Findings and Technical Documentation (CRWMS M&O 1997). These existing data were used to evaluate alternative models. The models using these data were not used in the findings recommended for use in TSPA-SR.

The data presented in the cited table that were used in this analysis were as shown in Table 4.

Table 4. Data from the 1997 Survey used to Scale 1990 Census Data to be Applicable to the 1997 Water Usage Data

Parameter	Number
Estimated Number of Households in Amargosa Valley	452
Estimated Number of Resident Adults in Amargosa Valley	893

4.1.4 Land Location

In section 5.4.2 (Water Usage and Active Farms) the location of land associated with water withdrawal permits are given by Range, Township, Section. Rather than attempt to explain the details of this time proven system of land identification, the reader is referred to the sources used by the author. These sources are “Death Valley Junction California-Nevada” (36116-A1-TM-100) (USGS 1993a) and Beatty Nevada-California (36116-E1-TM –100) (USGS 1993b), where both publications are 1:100000-scale metric topographic maps. When consulting these references, the following facts should be remembered.

Range, Township, and Section (R, T, & S) are defined by the State. For Nevada, the R, T, & S designators within Amargosa Valley terminate at the boundary with California.

R & T, being based on a rectilinear grid, are designed for a flat earth. The finite diameter of the earth demands that the ideal rectangular grid must become distorted to fit reality.

Agricultural usage of water is limited to the Nevada portion of the land shown on these maps. However, the NV-CA border does intersect some Sections where farming activities are conducted.

4.2 CRITERIA

4.2.1 Overview

The U.S. Nuclear Regulatory Commission's (NRC's) Total System Performance Assessment and Integration (TSPA&I) Issue Resolution Status Report (IRSR) (NRC 1998) establishes generic technical acceptance criteria. These criteria are considered by the NRC staff to be essential to a defensible, transparent, and comprehensive assessment methodology for the repository system. These regulatory acceptance criteria address five fundamental elements of the DOE TSPA model for the Yucca Mountain site, namely:

1. Data and model justification (focusing on sufficiency of data to support the conceptual basis of the process model and abstractions)

2. Data uncertainty and verification (focusing on technical basis for bounding assumptions and statistical representations of uncertainties and parameter variabilities)

3. Model uncertainty (focusing on alternative conceptual models consistent with available site data)

4. Model verification (focusing on testing of model abstractions using detailed process-level models and empirical observations)

5. Integration (focusing on appropriate and consistent coupling of model abstractions).

Relevant to the topic of this AMR, elements (1) through (4) of the acceptance criteria are addressed herein. Element (5) of the NRC acceptance criteria, which strictly applies to the completed synthesis of process-level models and abstractions, will be addressed separately in the TSPA-SR.

This AMR was prepared to comply with the above NRC TSPA&I acceptance criteria. The water usage analysis is considered a part of the Biosphere effort to be reported in the Biosphere PMR. By the criteria discussed below in 4.2.2, this effort, like other biosphere AMRs uses the characteristics of the present day population in Amargosa Valley to generate results to be used in TSPA-SR. However, this effort is divorced (i.e., no common predecessor AMR) from the other Biosphere AMRs that are structured to develop the Biosphere Dose Conversion Factors (BDCFs). Initially it was thought that there would be a common tie with the critical group

through drinking/domestic water use. However, as is concluded in section 6.3, the total domestic water used by the hypothetical farming community is a small fraction of the total water used. In arriving at total water use, this domestic component is conservatively ignored.

4.2.2 Regulatory Details

At present, there is no legal definition of the criteria to be place on the disposal of high level waste in a proposed geologic repository at Yucca Mountain, Nevada. When, after due process, Title 10 CFR Part 63 is enacted, the legal requirements will be incorporated into the Monitored Geologic Repository Requirements Document and will become the criteria on which the predicted performance f the repository will be gauged. Until this occurs there are no criteria. To allow progress to be made on this Water Usage AMR, the DOE Memorandum (Dyer 1999, section 115) and the proposed 10 CFR Part 63 (63.115) will be used as surrogate criteria.

This AMR complies with the DOE interim guidance (Dyer 1999) and the specified Subparts/Sections of the proposed NRC high-level waste rule, 10 CFR Part 63 (64 FR 8640). In particular details given in Section 115 "*Characteristics of the Reference Biosphere and Critical Group*" and further discussed in the Supplemental Information VI, "*Reference Biosphere and Critical Group for Yucca Mountain*," are applicable to this analysis. These criteria are more fully discussed below.

4.2.2.1 DOE Guidance

4.2.2.1.1 Section 115

Section 115 of the draft of the interim guidance provided by DOE (Dyer 1999) provides the "*Characteristics of the Reference Biosphere and Critical Group*." The applicable parts of this section are given below[2].

Sec. 115 Required characteristics of the reference biosphere and critical group.

(a) Reference biosphere. (1) Features, events, and processes that describe the reference biosphere shall be consistent with present knowledge of the conditions in the region surrounding the Yucca Mountain site.

(2)……

(b) Critical Group. (1) The critical group shall reside within a farming community located approximately 20 km south from the underground facility (in the general location of U.S. Route 373, near Lathrop Well, Nevada).

(2) The behaviors and characteristics of the farming community shall be consistent with current conditions of the region surrounding the Yucca Mountain site. Changes over time in

[2] The sections of the interim guidance used in this AMR (Dyer 1999) are identical to those given by the NRC (64 FR 8640)

the behaviors and characteristics of the critical group including, but not limited to, land use, lifestyle, diet, human physiology, or metabolics; shall not be considered.

(3) The critical group resides within a farming community consisting of approximately 100 individuals, and exhibits behaviors or characteristics that will result in the highest expected annual doses.

(4) ……

4.2.2.1.2 Section 114

At paragraph (b), this section specifies that the TSPA analysis shall, "*Account for uncertainties and variabilities in parameter values and provide the technical basis for parameter ranges, probability distributions, or bounding values used in the performance assessment*."

Furthermore paragraph (c) states that *alternative conceptual models of features and processes that are consistent with available data …. shall be considered*.

4.2.2.2 Supplementary Information to Part 63

In section VI (Reference Biosphere and Critical Group for Yucca Mountain) of the Supplementary Information (64 FR 8640 p. 8645-6), the NRC provide their rationale behind the biosphere portion of proposed regulations for Yucca Mountain. In the discussion, NRC states that, "*It is reasonable to assume that a farming community of sufficient size (as opposed to a few isolated farms) would be needed to supply the range of locally grown food that is currently consumed in the Yucca Mountain region. Such a farming community of up to 100 individuals, residing on approximately 15 to 25 farm, is consistent with current conditions of the region (substantially more farms would increase water demand and further decease radionuclide concentration in pumped water; substantially fewer farms would restrict the availability of locally produced foods relative to the regional average). ……. The Commission considers it desirable to constrain the determination of the contamination levels of locally produced foods because it is not possible to precisely determine concentrations in ground water at specific locations or to avoid speculation regarding individual farms and water withdrawal practices. The concentrations of radionuclides in the water used by a larger farming community, by contrast, can be determined by dividing the annual release of radionuclides to the location of the farming community by the annual water demands of the farming community. For a community of sufficient size, it can be assumed that water demand is large enough to "capture" the entirety of the contaminated plume.*"

4.3 CODES AND STANDARDS

No codes or standards apply to this analysis.

5. ASSUMPTIONS

5.1 CONSERVATISM

If a radionuclide reaches the location of the DOE's (and NRC's) hypothetical farming community, the predicted dose to the specified receptor (the average member of the critical group) is proportional to the radionuclide concentration in water withdrawn from wells. The predicted concentration of radionuclides in the water is itself inversely proportional the annual volume of water withdrawn. It is assumed that in the absence of accepted or qualified data needed to support a more refined approximation it is acceptable to use a simple approximation that is demonstrably conservative. In the case of this analysis, a conservative approximation is one that reduces annual water usage and thereby increases annual dose to the receptor. This assumption of conservatism is used to justify ignoring the small domestic use of water in estimating total water use. In addition, conservatism was a factor in recommending the use of "unconsolidated farms" as the basis for agricultural water usage.

5.2 PLUME CAPTURE

As directed by the DOE and NRC and repeated in section 4.2.2.1, it is assumed, for the hypothetical farming community of 100 people located near Lathrop Wells, that water demand is sufficiently large to "capture" the entirety of the contaminated plume. No TBV is required as this assumption was made at the behest of the regulator. This assumption provides a basis and justification the work presented in this report. Any alternative and more detailed approach would be subject to both much uncertainty and speculation.

5.3 DEMOGRAPHICS

5.3.1 Changes over time

Accepted data used in this report are from (a) the 1990 census (section 4.1.3.1) and (b) the State published 1997 groundwater usage data for Amargosa Valley (section 4.1.1). Those analyses based upon the number of residences (sections 6.2.1.2 & 6.2.1.3.3) assumed that the average number of persons resident in a household did not change between 1990 and 1997 despite a large population increase in the region. The number of households was 236 in 1990 and this increased to an estimated 452 households in 1997. This information was used to evaluate alternative models. These alternative models were not used in assessing the water usage for TSPA-SR. Therefore, TBVs are not required.

5.3.2 Characteristics of the Farming Community

The interim guidance from DOE (Dyer 1999. Sec. 115(b)(3)) and the proposed rule for the repository at Yucca Mountain (64 FR 8640, 63.115(b)(3)), provide the scenario on which water usage is to be based. The scenario is that, the farming community is defined as consisting of approximately 100 individuals. In addition, at 115(b)(2) defines the critical group as residing in a farming community with behaviors and characteristics consistent with the current conditions surrounding the Yucca Mountain site. Thus if Amargosa Valley is considered to be a farming

community, it would be a simple matter to derive the annual water usage of the hypothetical farming community from the data available for the Amargosa Valley community.

A review of the 1990 census data (given in Attachment III) indicated that only a small fraction of the community of Amargosa Valley were employed in farming activities. The data show that (item "*Persons*") there were 724 persons residing in 236 households (item "*Households*") in Amargosa Valley in 1990. Of these, only nine people were classed as being 16 years or older and employed in "*Agriculture, forestry, and fisheries*," (item "*Industry*"). Under item "*Farm self-employed income in 1989*" nine households were determined to have farm self-employed income.

It can be shown that the Amargosa Valley in 1990 had only a small fraction of its residents employed in farming. If each self-employed household is assumed to have two agricultural workers, then about 27 people were employed on the land. This means that only about 3.7% of the population were engaged in farming in the 1989/90 time frame.

A scenario based upon the above interpretation is evaluated in the AMR. However, the small fraction of the population in Amargosa Valley engaged in farming suggest that using the existing community as a surrogate for the farming community is not the intent of the proposed rule.

In section VI (Reference Biosphere and Critical Group for Yucca Mountain) of the Supplementary Information[3] (64 FR 8640. p. 8646) the following statement is made. "*Such a farming community of up to 100 individuals, residing on approximately 15 to 25 farms, is consistent with current conditions of the region (substantially more farms ....)*". This indicates that the proposed farming community should be based on the existing farms in the areas (and not on the total population). It is assumed that this interpretation is correct.

To generate estimates of annual water usage requires the assumption that the data generated in Amargosa Valley (by both the Census and the DOE Survey) can be used to derive the parameters needed to characterize the proposed hypothetical farming community. This assumption does not need a TBV as the statement by DOE (Dyer 1999) at Sec. 115(b)(2), reproduced above in section 4.2.2.1.1, directs that this assumption be made.

5.4 FARMS

5.4.1 Farms and Inhabitants

As discussed in 5.4.1 there are two possible interpretations of the intent of the interim guidance (Dyer 1999) and the Supplementary Information to the proposed rule (64 FR 8640). Both interpretations (100 individuals or 15 to 25 farms) are used in Section 6 to derive annual water usage. Both analyses are included to allow the impact of both interpretations to be evaluated. The recommendation of water usage in this AMR is based on the assumption that the Supplementary Information (64 FR 8640. p. 8646) directs the assessment to be made using a hypothetical farming community of about 15 to 25 farms.

[3] This information is not contained in the interim guidance from the DOE (Dyer 1999).

5.4.2 Water Usage and Active Farms

With the available data, it was apparent that there were several possible ways of using the data to derive total water usage. Each approach had its own assumption(s). To demonstrate that alternative approaches had been investigated, the more obvious ones are discussed below. Whether of not the particular approach was used to derive water usage, the assumptions associated with the approach are discussed.

5.4.2.1 Review of Raw Water Usage Data

A review of the Groundwater Usage Data presented in Attachment II and discussed in 4.1.1 yields some interesting and potentially relevant facts. The first is that many parcels of land with water rights showed zero water usage in 1997. Several other owners are reported to be irrigating only a small fraction[4] of their land. By virtue of being allocated water rights, these areas should have been in agricultural production, at some time in the past. A potential approach to determine water usage for the "*farming community*" would be to consider all land in Amargosa Valley that has allocated irrigation water rights. This approach was considered speculative (irrigation rate and fraction of land under cultivation) and not consistent with current conditions. Thus, this approach was not used. Had the assumption been employed, it would have used farms with all land under production at a given time. This would yield a result that would not be conservative with regard to present day conditions (i.e., water usage would be over-estimated). The analyses undertaken were based on actual groundwater usage in Amargosa Valley as reported by the State for 1997.

5.4.2.2 Minimum Viable Farm Size

As stated in 4.2.2.1.1, the dose receptor (average member of the critical group) shall reside within a farming community at a specified location. In addition, the behaviors and characteristics of the farming community have to be consistent with current conditions of the region surrounding the Yucca Mountain site. Furthermore, changes over time (in particular of land use) shall not be considered.

In the course of doing this work, the intent of the above was given some thought as to whether there should there be a minimum size (of land under cultivation) attributed to a "farm" within the farming community. To answer this question would require many years of historical water usage data to determine the changes over time of farming intensity in the region. Such an approach would appear to be at variance with the NRC's requirement that changes over time are not be considered. The present author is of the opinion that the NRC's intent was to avoid speculation on changes in the future after permanent closure. This is based on the logic that until a license is granted the "clock" has not started in terms of regulatory compliance.

The current agri-business in Amargosa Valley is based on dairy farming. Cows and in particular cow food (growing alfalfa) are the present drivers in water use. Ironically, this farming niche

[4] Large area users tend to grow alfalfa using a center spigot which on a rectangular land ownership grid is only about 78% efficient.

carved out in rural Nevada to supply milk to California is based more on ancillary factors (such as permits, state regulations, tax considerations) rather than on agricultural conditions and climate beneficial to bovine well being. As the political and business climates could change rapidly and could have severe repercussions on the present local farming community, it was considered unwise to only consider the larger farms which may not be present at the time of site recommendation or license application (construction, receipt of waste, or closure).

In an initial and unreported scoping analysis, the evaluation was performed as a function of "cut-off" size (i.e., irrigated acres) for farms. While this exercise was interesting, it did indicate that any numerical limit for such a cut-off, without further study on the historical economic viability of farms in the area, would be arbitrary and not conservative. Intuitively, it can be seen that ignoring "small farms" and estimating average farm usage from data on only "large farms" would lead to a systematic bias toward high volume usage.

In light of the above logic and to avoid any accusation of bias, it was decided to embrace the conservative concept that all irrigation water users of record in 1997 were indeed farms. All these farms would be used to estimate water usage by the hypothetical farming community. This assumption was used in Sections 6 and 7.

5.4.2.3 The Conservative Approach of One Water Permit - One Farm

The accepted data identified in section 4.1.1 provides water usage listed by Permit and/or Certificate number. The data are tabulated sequentially by these numbers. In cases where the "Owner of Record" has multiple permits or certificates for a place of use (given by Range, Township, Section, 3, 3), these other permits or certificates are also defined. For this approach the assumption is made that each of the entries in the water usage report comprise a single farming unit. This is justified by virtue of the land in question being a single piece of real estate owned by one person. This assumption was used in Sections 6 and 7.

5.4.2.4 Potential Farms – Adjacent Lands with a Single Owner

When all the water usage data are reviewed (especially when sorted by "Owner of Record"), it is apparent that there are cases where one person (or group) owns other lands with the attendant water rights. Moreover, when reviewed more carefully (by range, township, section as mentioned in 4.1.4 some of these multiple areas owned by a single person are geographically adjacent. Thus, it could be claimed that in such cases, a single farming unit may be the consolidation of two or more land areas each with their own water permit(s). Such a consolidation would reduce the number of farming units as simply defined in 5.4.2.1. This act would increase the annual water usage by the "average farm" (same volume of water shared by fewer farms). In turn, this act of consolidation of the farmed areas would have the non-conservative affect of increasing the total water usage by the specified number of farms in the hypothetical community. To avoid the non-conservatism inherent in this approach, consolidation is only considered as a supportive analysis to demonstrate to the reader the impact of this approach on water usage. For this analysis, it is assumed that adjacent and used lands owned by

the same entity comprise a farm on which the water consumption per farm will be established. This assumption of farm consolidation was used in sections 6.2.1.3 et seq.

6. ANALYSIS/MODEL

Whenever there are sufficient data to justify a statistical analysis to allow upper and lower limits to be derived on estimated parameters this is done. This mandated requirement (Dyer 1999, Sec. 114) was discussed in 4.2.2.1.2.

6.1 DEMOGRAPHIC DATA

Before looking at any water usage, some analyses are required on demographic data. To consolidate the demographic data in one location the base data from 4.1.3 are repeated here in Table 5.

Table 5. Demographic Data for the Amargosa Valley from the 1990 Census and the 1997 Survey that were used in at least some of the Analyses in this Report

1990 Census		1997 Survey	
Persons	724	Adults	893
Households	236	Households	452

6.1.1 Age Distribution

The age distribution from the 1990 census and presented in 4.1.3.1.2 was imported into an Excel spreadsheet. The "SUM" function was used to calculate the number of residents of age 17 years and below in addition to those of age 18 years and above. A printout of this spreadsheet in reproduced in Attachment IV. An electronic read-only copy of the spreadsheet is attached to report.

The results of this calculation was that there were 462 person of age 18 years or older (i.e., adults) resident in the Amargosa Valley in 1990. Using the total population data given in 6.1, shows that adults make up 63.8% of the population.

6.1.2 Household Size Distribution

The data giving the distribution of household size (number of residents) from the 1990 census and given in 4.1.3.1.3 were imported into an Excel spreadsheet. An additional column was inserted to accept the total number of people in that size of household. For each row this number was generated by taking the product of the number in the column showing the "Number of Persons in the Household" and the column giving the "number of people". The columns giving the "number of households" and the "number of people" were each summed. It should be noted that the total population generated was slightly less (by 3) that the actual total given in 6.1. A correction could have been applied for this rounding error that arose by virtue of the last row being inclusive of the group with seven or more persons. Because the error is small (of the order of 0.4%, i.e., about three in 720) this correction was not applied. An additional justification for

not making the correction was that in the final step of the analysis an uncertainty value was to be determined which put the small correction in perspective. The average number of persons in a household was then determined by dividing the total number of households into the total number of people. The average number of person in a household in 1990 was 3.06.

The next step was to calculate the standard deviation (s) of this household size distribution. This was performed in the spreadsheet using the following standard equation. A printout of the spreadsheet is shown give in Attachment IV. An electronic read-only copy of the spreadsheet is attached to report.

$$SS = \sum_x n(x)(x - \bar{x})^2 \qquad \text{(Bulmer M. G. p. 57)}$$

$$s = \sqrt{\frac{SS}{(n-1)}} \qquad \text{(Bulmer M. G. p. 130)}$$

where $SS =$ the Sum of Squares
$n =$ the number of times there are x people in a household
$\bar{x} =$ the average number people in a household

The ith entry in this equation SS in shown in the appropriate row in the column titled "Square of Difference." These squares were summed on the row titled "Totals." Under the label SD is given the standard deviation (s) by taking the square root of the sum of squares divided by $(n-1)$ [i.e., 235]. The standard deviation of the number of people in Amargosa Valley households for 1990 was 1.67.

6.1.3 Number of Households (Farms) in the Farming Community

The DOE (Dyer 1999, Section 115) specified that the farming community should contain approximately 100 individuals (see 4.2.2.1.1). For the analysis in this section the number of people will be taken to be exactly 100. Using the estimate for the average number of people in Amargosa Valley household obtained in 6.1.2 of 3.06, then the expected number of households containing 100 people is 32.73. The Central Limits Theorem (Bulmer M. G. p. 115 et seq.) tells us that if n samples are drawn for a well behaved (i.e., moments are finite) distribution with an estimated mean of $\bar{x}$ and an estimated standard deviation of s, then the sum of the n samples will be approximately normal with a mean of $n\bar{x}$ and a standard deviation of $s\sqrt{n}$. This assumption of normallity will break down only if n is small or if the underlying distribution is highly abnormal (Bulmer M. G. p. 120). The estimate of households arrived at above of 32.73 is sufficient large to provide a reasonable basis for an uncertainty analysis. As the distribution of the sum of 32.73 random samples is approximately normal, the 95% confidence interval can be estimated as being 1.96 times the expected standard deviation. The expected standard deviation of the population distribution is 9.53, so the 95% confidence interval is 18.68 above and below the mean of 100. With an average of 3.06 persons per household, the corresponding uncertainty in the number of households containing 100 people is therefore 6.12. So 100 people can be

expected to reside in somewhere between 26.62 and 38.85 households. These calculations are given in both the hard and soft copy of the spreadsheet.

This estimate may seem at variance with 15 to 25 farms discussed in 4.2.2.2. However, the distribution of households and farms present in Amargosa Valley could readily accommodate 20 farms with between 7 and 18 additional non-farm residences. Therefore, the values of farms and people used by NRC (64FR 8640, p.8645-6) appear to be reasonable.

6.2 AGRICULURAL WATER USAGE

6.2.1 Determination of Water Usage by Unit (Farm/Residence)

As discussed in 4.2.2.2 and 4.2.2.1 and in 6.1 water usage can be determined by considering either Farms or population. As required by the regulations and discussed in 4.2.2.1.2, both interpretations will be evaluated.

6.2.1.1 Water Usage Based on Individual Active Permits

The conservative assumption discussed in 5.4.2.3, that each active water usage permit represents a farming unit as prescribed by NRC and discussed 4.2.2.2 is addressed in this section. The "Water Usage" sheet of the spreadsheet contains the numerical calculation described below. The results of each major step of the calculation are reproduced in Table 6.

6.2.1.1.1 Data Sorting

The groundwater usage data for Amargosa Valley discussed in section 4.1.1 and presented in Attachment II, were entered into a spreadsheet. These data from the spreadsheet are given in Attachment V. The second column of this spreadsheet was used to flag any mention in the original data that the usage was associated with a dairy. This was done for two reasons. First, some dairy use had been categorized as commercial (feed water for cattle is not irrigation water and is thus not categorized as "irrigation"). Second, the same data would be used in the later analysis where "farms" were consolidated and it was convenient to flag dairies to aid the process. An electronic copy of this spreadsheet is supplied with this report. The "raw data" as published by the State is on the first sheet (titled "Raw Data") of the spreadsheet. Where the "owner of record" was not identified, the character "?" was used.

All the data were copied onto the second sheet (Labeled "By Cat" as an abbreviation for "By Category") of the spreadsheet. The following actions were taken.

a) The data were sorted by the water usage column to separate out those entries not using water.

b) A new column (J) was used for the entry of 1, 0, or –1, depending on an evaluation of the water usage. The groups used were: (1) agricultural, (0) for infrastructure in the region (e.g., post office, hotels, laundromats, commercial properties, trailers, etc.), and (-1) for mining or other activities (wildlife refuge).

c) The data were sorted by this "use" identifier. Blank rows were introduced to enhance readability.

d) The data in the agricultural category were then sorted by (1) the column containing the "D" for dairy identifier and (2) by "owner of record" (i.e., alphabetic). (Scanning this list it can be seen that there are several cases where the same "owner of record" owns and uses land within the same section or on adjacent sections. This is rationale for considering consolidation as an alternative approach for determining water usage.)

e) The data from the active farms block of data (i.e., those with the use identifier of 1) were copied onto a new sheet "Water Usage." A new column (A) was inserted and used to number each entry sequentially starting at 1.

f) Unnecessary columns were deleted, leaving only the columns of entry number, "Owner of Record", "Irrigated Acres", and water usage "Ac*Ft."

6.2.1.1.2 Approach for Determining Agricultural Water Usage

The approach, which is also used to evaluate the other approximations, is given below. The basis for step (f) is the Central Limits Theorem that was discussed in 6.1.3. If the true mean of the water usage distribution is μ, then we would expect the distribution of multiple measurements of $\bar{x}$ to be approximately normal with mean μ and a standard deviation of $\frac{s}{\sqrt{n}}$. Therefore, the 95% confidence interval for μ would be approximately $\bar{x} \pm 1.96 s / \sqrt{n}$.

(a) A confidence level is defined. For the purpose of all analyses presented here the confidence level was set to a value of 95%. In the spreadsheet the confidence level was a user definable variable to allow sensitivity studies to be undertaken as and when necessary.

(b) From the confidence level value, the Excel function "NORMSINV" was used to define appropriate multiplier (this is the usual 1.96 for the 95% level).

(c) The number of active farms were determined by using the Excel "COUNT" function.

(d) The average annual water usage by the active farms was determined by using the Excel function "AVERAGE".

(e) The standard deviation of the average annual water usage by the active farms was determined by using the Excel function "STDEV".

(f) The statistical uncertainty (to the confidence level defined in (a)) was determined by taking the product of (1) the multiplier defined in (b) and (2) the standard deviation derived in (e), and dividing this number by (3) the square root of the number of active farms as determined in (c).

(g) The upper and lower limits to the average annual water usage was determined by adding and subtracting the uncertainty value determined in (f) to/from the measured mean values from (d).

6.2.1.1.3 Result of the Calculation

The results of the above steps for the 95% confidence interval are given in Table 6.

Table 6. Estimates of Annual Water Usage per Farm based on 1997 Active Water Permits

Parameter	Value	Unit
Confidence Level (CL).	0.95	
1- CL	0.05	
CL Factor from Normal Distribution	1.96	
Number of Farming Units	112	"farms"
Mean Water Usage	96.92	ac-ft/yr
Standard Deviation (S. D.) of Water Usage	203.95	ac-ft/yr
Uncertainty in Mean Water Usage	37.77	ac-ft/yr
Upper Limit on Mean Water Usage	134.69	ac-ft/yr
Expected Water Usage	96.92	ac-ft/yr
Lower Limit on Mean Water Usage	59.15	ac-ft/yr

The upper and lower limits for average water usage (given in Table 7) in conjunction with the specified number of farms (as given in 4.2.2.2) will be used section 7 to generate the limits for total annual water usage by the hypothetical farming community.

6.2.1.2 Water Usage Based on the Total Number of Residences

The methodology given in 6.2.1.1.1 was used to calculate the mean as well as the upper and lower bounds on annual water usage by individual households. To facilitate this without having to generate a new spreadsheet required adding the appropriate number of additional households so that of the total was equal to that reported in 4.1.3.2 (i.e., 452). Each of these additional households (from number 64 to 452) was assigned zero water usage (domestic usage is to be factored in later). The “Water Usage” sheet of the spreadsheet contains the steps performed. Each step of the calculation is reproduced in Table 7.

Table 7. Estimates of Annual Water Usage per Household based on 1997 Active Water Permits

Parameter	Value	Unit
Confidence Level (CL).	0.95	
1- CL	0.05	
CL Factor from Normal Distribution	1.96	
Number of Residences	452	
Mean Water Usage	24.02	ac-ft/yr
Standard Deviation (S. D.) of Water Usage	109.51	ac-ft/yr
Uncertainty in Mean Water Usage	10.10	ac-ft/yr
Upper Limit on Mean Water Usage	34.11	ac-ft/yr
Expected Water Usage	24.02	ac-ft/yr
Lower Limit on Mean Water Usage	13.92	ac-ft/yr

The upper and lower limits for average water usage given in Table 7. These data in conjunction with the specified number of residences (derived in 6.1.3 for the number of people defined in 4.2.2.1.1) could be used, if so desired, to generate the limits for annual water usage by the hypothetical farming community.

6.2.1.3 Water Usage Based on Consolidated Farming Units

As discussed in 5.4.2.4, review of the Ground Water Pumpage Inventory data shows that there are several instances of a single person owning and using two or more water allocations. Further inspection shows that these agricultural areas are in general either overlapping (in terms of being within the smallest area definable i.e., a 3 3 of a section) or in close proximity. This observation raises the possibility that such single owner agricultural lands are single farming units. If this were so, then the water consumption by the "*farming community*" defined by the NRC and discussed in 4.2.2.1.1 should be based on the average annual water usage of these larger consolidated units. This is not the preferred route because it is not demonstrably conservative. In addition, it would necessitate multiple TBV on ownership and usage. Never the less, this scenario was considered important as it provides insight into the impact of possible alternative approaches for the future. The approach was evaluated but at this stage was not put under QA program because of the many TBVs that would be necessitated.

6.2.1.3.1 Data Sorting

To evaluate water usage for this scenario the steps a) through d) described in 6.2.1 et seq. was followed. The analysis continued as described below. A copy of this spreadsheet data is given in Attachment VI.

e) The data from the active farms block of data (i.e., those with the use identifier of 1) were copied onto a new sheet "Farms Sub-totals."

f) For each entry with a given name, the location (place of use) was checked to ensure that it was a reasonable assumption to consider each water usage location as part of a single farming unit. In the case of the "De Lee Trust" reference has to be made to the topographic maps discussed in 4.1.4 as the "place of use" of the multiple entries were on different sections, ranges and townships. The entries numbered 130 and 131 under the generic term "dairy" were because of location considered a part of "Rockview Dairies." The "No Permit" unknown ("?") users 128 and 129 were considered a single user (both in section 9 of R 49 T 17) and given designator "?1", while "?" # 126 being in section 12 was considered independent (and designated ?2).

g) The Excel subtotal capability (under "Data, Subtotals ….") was used to insert the subtotals of "Owner of Record" at each change in "Owner of Record." This is shown on sheet "Farms Sub-totals."

h) The whole of the sheet "Farms Sub-totals" were copied onto a new sheet "ID Totals."

i) The Excel "Text" function "RIGHT" was used in column "K" to select the five leftmost characters in the text in column D.

j) The Excel "IF" statement was used in column "L" to insert a "1" if column "K" contained the text "Total", otherwise a "0" was inserted.

k) The result of these actions can be seen the sheet "ID Totals."

l) The whole of sheet "ID Totals" was copied and pasted (using "Paste Special – Paste Values") onto a new sheet "Sort by Total."

m) To separate the "TOTALS data" for the individual data all data was sorted by the Excel sort function using column "L" descending as the sort criterion.

n) The result of these actions can be seen the sheet "Sort By Total."

o) The "Rows" containing the Totals data were copied onto the sheet "Water Usage"

p) The data were sorted by annual water usage.

q) Each row was given an identification number corresponding to its position in the list.

r) Unnecessary columns were deleted, leaving only the columns of entry number, "Owner of Record", "Irrigated Acres", and water usage "Ac*Ft."

6.2.1.3.2 Water Usage Based on Consolidated Active Farms

The analysis for this evaluation follows that given in 6.2.1.1.1, and will not be repeated here. The details are shown on sheet "Water Usage."

The results of the above steps for the 95% confidence are given in Table 8.

Table 8. Estimates of Annual Water Usage per Farm based on 1997 Active Water Permits with Consolidation of Farms

Parameter	Value	Unit
Confidence Level (CL).	0.95	
1- CL	0.05	
CL Factor from Normal Distribution	1.96	
Number of Farming Units	44	"farms"
Mean Water Usage	246.7	ac-ft/yr
Standard Deviation (S. D.) of Water Usage	497.72	ac-ft/yr
Uncertainty in Mean Water Usage	147.07	ac-ft/yr
Upper Limit on Mean Water Usage	393.77	ac-ft/yr
Expected Water Usage	246.7	ac-ft/yr
Lower Limit on Mean Water Usage	99.63	ac-ft/yr

6.2.1.3.3 Water Usage Based on Consolidated Farms and the Total Number of Residences

The approach adopted exactly followed the steps given in 6.2.1.2. The calculations are shown on sheet "Water Usage." The results are given in Table 9

Each step of the calculation is reproduced in Table 9.

Table 9. Estimates of Annual Water Usage per Household based on 1997 Active Water Permits with Consolidation of Farms

Parameter	Value	Unit
Confidence Level (CL).	0.95	
1- CL	0.05	
CL Factor from Normal Distribution	1.96	
Number of Residences	452	
Mean Water Usage	24.02	ac-ft/yr
Standard Deviation (S. D.) of Water Usage	170.23	ac-ft/yr
Uncertainty in Mean Water Usage	15.69	ac-ft/yr
Upper Limit on Mean Water Usage	39.71	ac-ft/yr
Expected Water Usage	24.02	ac-ft/yr
Lower Limit on Mean Water Usage	8.32	ac-ft/yr

6.2.2 Agricultural Water Usage by the Community.

6.2.2.1 No Consolidation of Farming Units

The total predicted annual groundwater usage depends on whether the community is defined by "farms" (15 to 25 from 4.2.2.2) or by the size of the community (approximately 100 people from 4.2.2.1.1). The upper and lower limits for these two approaches are provided in Table 10. Note that the values shown in this table are based upon the expected number of units (farms or residences) and not upon the estimated limits of these parameters. Further discussions on this topic and the proposed sampling algorithm for use in the stochastic TSPA-SR code to include these variations are presented in section 7 for the recommended way forward.

Table 10. Summary of Predicted Total Annual Agricultural Water Usage based on data with no Consolidation of Farming Units

Basis	Expected Number	Lower Limit (acre-feet per year)	Expected Value (acre-feet per year)	Upper Limit (acre-feet per year)
Population (100 people)	32.73 Households	456	786	1116
Farms	20 Farms	1183	1938	2694

6.2.2.2 With Consolidation of Farming Units

When the possibility of the consolidation of the farming units is considered the expected annual agricultural water usage along with the associated lower and upper limits are given in Table 11. As could readily be predicted, the expected value of water usage based on population is identical for both the non-consolidated and consolidated case. (The total water usage is independent of how the individual farming units are grouped.) It is not immediately obvious why the uncertainty in usage for the consolidated case is larger than it was for the non-consolidated case. This arises because with fewer, but larger, farming units the standard deviation increases while the mean usage stays constant. Thus, there is a wider spread between the lower and upper limits.

Table 11. Summary of Predicted Total Annual Agricultural Water Usage based on data with Consolidation of Farming Units

Basis	Expected Number	Lower Limit (acre-feet per year)	Expected Value (acre-feet per year)	Upper Limit (acre-feet per year)
Population (100 people)	32.73 Households	272	786	1300
Farms	20 Farms	1993	4934	7875

6.3 DOMESTIC WATER USAGE

The groundwater usage data for the Amargosa Valley described in 4.1.1 indicates that domestic use accounted for 366 acre-feet in 1997.

6.3.1 Domestic Water Usage by Household

Using the estimated number of households of 452 (from 4.1.3.2), gives an estimate of annual domestic water usage of 0.81 acre-feet per household. A review of the State Data on water usage (see 4.1.1) indicates in the "Remarks" column that some water usage reported as used for irrigation and "QM" (quasi-municipal) was used for domestic purposes. This could imply that the usage categorized under "Domestic" may be an underestimate. Any such error would cause a conservative bias to the data.

6.3.1.1 Alternative Calculation of Domestic Water Usage By Household

To provide a check on the household usage of 0.81 acre-feet per year per household, the (existing) data identified in 4.1.2 can be used. For Nye County (within which Amargosa Valley lies), this usage of self-supplied water is 208 gallons per day per person. According to data identified in 4.1.3.2 there were 893 adults resident in the Amargosa Valley in 1997. Assuming the age distribution (adults to total population fraction of 63.8% from 6.1.1) from the 1990 census data is valid in 1997, an estimate can be derived for domestic water use. This is done in the following steps.

The 893 adults correspond to a total population of 1400 (i.e., 893) 0.638)

At 208 gallons per day per person this comes to 2.91×10^5 gallons per day or 1.06×10^8 gallon per year (assuming 365.25 days per year).

As this usage is for 452 household, the annual household usage is 2.4×10^5 gallons.

As one million gallons is 3785 cubic meters, the household usage is 8.91×10^2 m^3. (LaCamera et al. 1995, p. iv.)

1233 m^3 is one acre-foot, so the annual household usage is 0.72 acre-feet. (LaCamera et al. 1995, p. iv.).

This estimate is in reasonable agreement with the value of 0.81 acre-feet per year derived from the Amargosa Valley data. If credit for domestic water usage is taken as part of the total water usage, then on the ground of being demonstrably conservative, it would be recommended that the lesser of these estimates is used.

6.3.2 Domestic Water Usage per Person

As reported in section 6.3 there were 366 acre-feet of groundwater used in 1997. This quantity of water was used by 1400 persons (6.3.1.1). Thus on average each person used 0.261 acre-feet for the whole of 1997. Therefore, the community of approximately 100 people will use approximately 26.1 acre-feet of groundwater per year.

6.3.2.1 Alternative Calculation of Domestic Water Usage per Person

As given in 6.3.1.1, the average domestic use of self-supplied water is 208 gallons per day per person.

At this rate, the annual usage is 7.597×10^4 gallons per year per person. Using the same steps as in 6.3.1.1, the following statements can be made.

As one million gallons is 3785 cubic meters, the annual per person usage is 287.6 m^3.

1233 m^3 is one acre-foot, so the annual per person usage is 0.233 acre-feet.

So the community of 100 people are expected to use 23.3 acre-feet per year for domestic purposes.

6.3.3 Domestic Water Usage Summary

From the above, a conservative estimate of domestic water usage for the farming community is 23 acre-feet per year. This total domestic usage is less than 10% of even the lowest lower limit estimate for agricultural water usage. This domestic water usage is considered to be an insignificant contributor to water usage.

7. CONCLUSIONS

7.1 SUMMARY

Four interpretations of the NRC's directive on the water usage in the reference biosphere have been evaluated. The four assessments were based on average water usage from non-consolidation/consolidation of existing farms and total water usage calculated from farms and populations. The evaluations led to differing results. No one result can be used in a confirmatory manner to justify the other(s).

7.2 RECOMMENDATION

7.2.1 Approach

As discussed in 5.3.2, the 1990 census data indicates that fewer than 5% of the population residing in Amargosa Valley have reported income from farming (these people are either self-employed or wage earners). For this reason, it is recommended that the interpretation of DOE and NRC's "*farming community*" should be based on farms and not on residents (in 32.73 households).

On the issue of whether to consider the existing farms to be consolidated, it would be definitively conservative to take each water permit as an independent farm. Using this estimate would provide some isolation from the effects of unforeseen events that could almost instantly change the character of the farming community in Amargosa Valley. That is if the large consolidated water users (i.e., the present day dairies) were to be replaced with independent small holdings

under the constraints of current water allocations, the average water usage by local farms would dramatically decrease. This would reflect in the total estimated water usage by the hypothetical community to shift to the non-consolidated farms value. Furthermore, as large volume dairy farming is relatively new to the area, a case could be argued that a true basis for the hypothetical community should be the historical water usage in the area. This would be based on the reported usage averaged over many years.

If, as was done in this evaluation, only a single year of data were to be considered then consolidation of adjacent land with a common owner would seem logical. This approach does increase significantly the estimated water usage by the hypothetical farming community. However, to provide the Yucca Mountain repository with a fully defensible and conservative position, this route of invoking consolidation cannot be recommended.

7.2.2 Recommended Annual Water Usage

As discussed in 4.2.2.1.1, the NRC in their discussion of the draft regulation specified, for the reference biosphere, a farming community of up to 100 individuals, residing on approximately 15 to 25 farms. Thus, the range of possible water usage values is greater than those shown in Table 10, which was constructed for 20 farms. To provide the reader with additional detail, the annual (agricultural) water usage in given in Table 12 as a function of number of farms. Note that credit for domestic usage has not been claimed as this would make only an insignificant perturbation on the total value and would necessitate carrying a TBV.

Table 12. Total Estimated Annual Water Usage as a Function of Number of Farms

Number of Farms	Lower Limit (acre-feet per year)	Expected Value (acre-feet per year)	Upper Limit (acre-feet per year)
15	887	1454	2020
20	1183	1938	2694
25	1479	2423	3367

7.2.3 Integration into RIP

A simple approach to incorporate a stochastic sampling routine to account for uncertainties for the annual water usage into RIP is presented here. This direct approach is thought preferable to attempting to develop and justify an approximating statistical probability function that is already available in the TSPA predictive code. The operations to be taken are as follows.

a) Select a random number (R_1) distributed uniformly over the interval -1 and 1.

b) Determine the average annual agricultural water usage (A) for this realization ($A = mean + R_1 \times uncertainty$) where mean and uncertainty are given in Table 6. This value represents an estimate of water usage over the 95%ile confidence limit range of the mean value.

c) Select a random integer (R_2) distributed uniformly from 15 to 25 representing the number of farms for this realization.

d) Determine annual agricultural water usage (T) by taking the product of R_2 and A. ($T = R_2 \times A$). This total value (T) will now reflect the independent stochastic nature of both the individual farm water usage and the number of farms to be considered.

e) Convert T from acre-feet to m^3 to use in determining the average annual concentration of radionuclides in the groundwater used in the biosphere dose calculations.

7.3 QA BASIS

The recommendations given in 7.2.3 for incorporating the analysis into the RIP code, accounts for uncertainty of water usage in the Yucca Mountain region and for the specified community size distribution. The numerical values recommended for RIP were derived from data determined to be "accepted data" that was subject to analysis that was shown to be conservative. Consequently, the recommended incorporation of water usage into RIP does not require any verification.

As discussed in 6.2.1.3, there are alternative approaches for the analysis of the data. From an interpretation of NRC's intent, using the basis of "farms" is the better approach to the one based on households. The alternative approach using "consolidated farms" is superficially reasonable. This approach results in an increase in predicted water usage (over that recommended in 7.2.2 and 7.2.3) of a factor of about 2.5. However, this approach would require justifying the validity of each consolidation. Although this basis for the consolidation may well be validated in the near future with the water usage estimates being judged as Qualified Data (QA), there is an attendant risk that conditions could change in the near future to the extent that the assumptions (on consolidation) would be no longer valid. Such an eventuality would necessitate a re-evaluation of available water use data with the possibility of downward revision in projected water usage.

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9. ATTACHMENTS

The attachments are listed as follows:

Attachment	Title
I.	Acronyms and Abbreviations
II.	Ground Water Pumpage Inventory Amargosa Valley, No. 230, 1997 (State of Nevada 1997). Note in the list of individual water users, each entry was given a sequential identification number for this work. This number does not appear in the State data.
III.	1990 Census Data (Bureau of Census 1990)
IV.	Spreadsheet - (a) Analysis of Age Distribution from 1990 Census Data and (b) Analysis of Household Size Distribution from 1990 Census Data
V.	Spreadsheet - Analysis of Water Usage - Farms not Consolidated
VI.	Spreadsheet - Analysis of Water Usage - Farms Consolidated

ACRONYMS AND ABBREVIATIONS

Ac	Acre
Ac-Ft	Acre Feet
AMOPE	Assistant Manager Office of Project Execution
CA	California
CFR	Code of Federal Regulations
CRWMS	Civilian Radioactive Waste Management System
DOE	United States Department of Energy
FR	Federal Register
Ft	Feet (or foot)
M&O	Management and Operating Contractor
MGR	Mined Geologic Repository
NRC	Nuclear Regulatory Commission
NV	Nevada
NY	Nye County, Nevada
PAO	Performance Assessment Operations
QA	Quality Assurance
TBD	To be Determined
TBV	To be Verified
TSPA	Total System Performance Assessment
TSPA-SR	Total System Performance Assessment-Site Recommendation

ATTACHMENT II

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, No. 230
1997
(State of Nevada 1997)

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

IRRIGATION	9,349 Ac-Ft
IRRIGATION (No Permits or Certificates)	1,105 Ac-Ft
AMERICAN BORATE (539 Ac/Ft pumped from California side included in total)	666 Ac-Ft
INDUSTRIAL-MINERAL VENTURES	251 Ac-Ft
BARRICK BULL FROG	1,589 Ac-Ft
QUASI-MUNICIPAL AND COMMERCIAL	576 Ac-Ft
OTHER	0 Ac-Ft
DOMESTIC (INCLUDES NO. 13574)	366 Ac-Ft
Total	13,902 Ac-Ft

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
1.	13574	Cert.	Heisler	SE	SE	9	12	46	3.20	DO	3.20	
2.	14054	Cert.	A. Bettles	NE	NE	12	17	48	16.70	0.00		
				SE	NE				8.70	0.00		
				TOTAL					25.40	0.00	0.00	
3.	14059	Cert.	Floridia Corp.	NW	SW	1	17	48	40.00	0.00		
	27813	Cert.		NE	SW				40.00	0.00		
				SW	SW				31.40	0.00		
				SE	SE				31.40	0.00		
				TOTAL					142.80	0.00	0.00	
4.	14078	Cert.	J. Guynes	NE	NE	15	16	48	39.40	0.00	0.00	
5.	15410	Cert.	Morris DeLee Trust	NW	NE	25	16	48	40.00	0.00		
				NE	NE				40.00	0.00		
				SW	NE				40.00	0.00		
				SE	NE				40.00	0.00		
									160.00	0.00	0.00	
6.	15702	Cert.	A. Scott	SE	NE	14	16	48	35.00	35.00	175.00	Pivot
7.	15881	Cert.	Matthew & Fox	NE	NW	10	16	48	16.38	0.00		
	49947			SE	NW				40.00	0.00		
				TOTAL					56.38	0.00	0.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
8.	15893	Cert.	J. Owens	NW	NE	23	16	48	40.00	31.25		
				NE	NE				40.00	31.25		
				SW	NE				40.00	31.25		
				SE	NE				40.00	31.25		
									160.00	125.00	625.00	
9.	15929	Cert.	Amargosa Farms	NE	NW	9	17	49	40.00	30.00		Illegal use in the NE SW &
	17241	Cert.		NW	NW				40.00	30.00		NW SW
				SE	NW				40.00	40.00		
				SW	NW				40.00	40.00		
				TOTAL					160.00	140.00	700.00	
10.	15929	Cert.	Rockview Dairies	NE	NE	9	17	49	26.40	5.00		
	29649	Cert.		NW	NE				35.00	15.00		
				SE	NE				31.40	7.00		
				SW	NE				31.40	7.00		
									124.20	34.00	170.00	
11.	16047	Cert.	H. Hughe	NE	SW	9	16	49	4.00	0.00	0.00	
12.	16178	Cert.	C. Defir	NE	NW	8	16	48	40.00	0.00	0.00	No meter or power
13.	16545	Cert.	J. Burke	NE	NE	28	16	49	21.98	21.98	109.90	Anvil Ranch
									14.7	14.7		
										36.68		

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
14.16562	Cert.	E. Selbach	NE	NE	16	16	48	40.00	37.50		
			NW	NE				40.00	0.00		
			SE	NE				25.00	25.00		
			TOTAL					105.00	62.50	312.50	
15. 17137	Cert.	C.Barr	NW	NE	35	16	48	10.00	0.00	0.00	
16. 17348	Cert.	Lisie Lowe	NE	NE	14	16	49	15.00	0.00	0.00	Wind break around North half of POU. Included in domestic.
17. 17404	Cert.	Morris DeLee Trust	NW	SW	25	16	48	40.00	0.00		
			NE	SW				40.00	0.00		
			SW	SW				40.00	0.00		
			SE	SW				40.00	0.00		
								160.00	0.00	0.00	
18. 17417	Cert.	J. Overholser	NE	NE	17	16	48	8.02	0.00		
			NW	NE				32.02	0.00		
			SE	NE				1.00	0.00		
			SW	NE				4.78	0.00		
			TOTAL					45.82	0.00	0.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
19.	17657	Cert. 6978	L. Dansby	NE	NW				2.70	1.00 ✓		Domestic, lawn & fruit trees
				SW	NW				7.50	0.00		
				SE	NW				20.00	0.00		
				TOTAL					30.20	1.00	4.00	
20.	17657	Cert. 7011	H. Jackson	NW	NW	15	16	48	→ NC 5.00 ? 5	0.00	0.00	
21.	17657	Cert. 7022	A. Cameron	NW	NW	15	16	48	2.50	2.00 ✓	8.00	3-mobile homes lawns, trees & windbreak
22.	17694	Cert.	J & R Development	SW	NW	15	17	49	19.00	5.00	25.00	Grapes & Wind break being irrigated
23.	18222	Cert.	Morris DeLee Trust	NE	NE	30	16	49	34.10	0.00		
				NW	NE				33.90	0.00		
				SW	NE				33.40	0.00		
				SE	NE				34.10	0.00		
				NE	NW				33.40	33.40		
				NW	NW				33.20	33.20		
				SW	NW				32.90	32.90		
				SE	NW				33.50	33.50		
				TOTAL					268.50	133.00	665.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
19.	17657	Cert. 6978	L. Dansby	NE	NW				2.70	1.00 ✓		Domestic, lawn & fruit trees
				SW	NW				7.50	0.00		
				SE	NW				20.00	0.00		
				TOTAL					30.20	1.00	4.00	
20.	17657	Cert. 7011	H. Jackson	NW	NW	15	16	48	NC → 5.00 ? 5	0.00	0.00	
21.	17657	Cert. 7022	A. Cameron	NW	NW	15	16	48	2.50	2.00 ✓	8.00	3-mobile homes lawns, trees & windbreak
22.	17694	Cert.	J & R Development	SW	NW	15	17	49	19.00	5.00	25.00	Grapes & Wind break being irrigated
23.	18222	Cert.	Morris DeLee Trust	NE	NE	30	16	49	34.10	0.00		
				NW	NE				33.90	0.00		
				SW	NE				33.40	0.00		
				SE	NE				34.10	0.00		
				NE	NW				33.40	33.40		
				NW	NW				33.20	33.20		
				SW	NW				32.90	32.90		
				SE	NW				33.50	33.50		
				TOTAL					268.50	133.00	665.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
24.	18764	Cert.	Rehers & Schultz	NW	NE	8	16	48	39.00	2.00	7.00	
	26442			NE	NE				32.40	2.50	12.50	
				TOTAL					71.40	4.50	19.50	
25.	18772	Cert.	C. Holtz	NW	NW	20	16	48	40.00	1.00 ✓	2.50	Fruit trees and wind break @
				SW	NW				39.00	3.50 ✓	8.75	2.5 Ac-Ft/Ac multiple
				NW	SW				40.00	1.00 ✓	2.50	domestic use & lawn not
				SE	NE	19			40.00	4.00 ✓	10.00	included in use amount
				TOTAL					159.00	9.50	23.75	
26.	19034	Cert.	Drury & Murdock	NW	NE	8	17	49		0.00		POU of the 100 acres to be
	21584			NE	NE					0.00		determined by agreement
				SE	NE					0.00		
				NE	SE					0.00		
				SE	SE					0.00		
				TOTAL					100.00	0.00	0.00	
27.	19197	Cert.	F. Cypert	NE	SW	22	16	49	2.50	0.00		
				NW	SE				2.00	0.00		
				SW	SE				1.00	0.00		
				SE	SE				7.00	0.00		
				TOTAL					12.50	0.00	0.00	Gas Auto Engine
28.	19448	Cert.	B. Barrackman	NW	NW	7	16	48	37.00	37.00	92.50	Pistachio trees and some grass @ 2.5 Ac-ft/Ac

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
29.	19916	Cert.	Morris DeLee Trust	NE	NE	24	16	48	40.00	25.75		Fruit trees & wind break
				NW	NE				40.00	15.75 ✓		Fruit trees & wind break
				SE	NE				40.00	2.00 ✓		Row crop & wind break
				SW	NE				40.00	0.50 ✓		Windbreak
									160.00	44.00	110.00	
30.	19917	Cert.	Morris DeLee Trust	NE	SE	24	16	48	40.00	31.25		Full Pivot
	22761	Cert.		NW	SE				40.00	31.25		
				SE	SE				40.00	31.25		
				SW	SE				40.00	31.25		
									160.00	125.00	625.00	
31.	20162	Cert.	Bradshaw & Strickland	NW	NE	35	16	49	20.00	0.00		
				NE	NW				10.00	0.00		
				TOTAL					30.00	0.00	0.00	
32.	20352	Cert.	H. Watson	NW	NW	1	17	48	40.00	31.25		
				NE	NW				40.00	31.25		
				SW	NW				40.00	31.25		
				SE	NW				40.00	31.25		
				Lt	09	36	16	48	26.00	0.00		
				Lt	10				21.90	21.90		
				Lt	11				26.00	26.00		
				TOTAL					233.90	172.90	864.50	Alfalfa

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
33.	20355	Cert.	O. Welch	SE	NW	2	17	49	3.20	0.00	0.00	
34.	20411	Cert.	D. Barnett	SE	NE	8	16	49	26.40	0.00	0.00	Domestic - no meter
35.	22140	Cert.	Clark & Peterson	NW	SW	8	17	52	8.00	2.00	10.00	Crystal
36.	22141	Cert.	Clark & Peterson	NE	SE	7	17	52	21.20	0.00	0.00	Crystal
37.	22233	Cert.	T. Smith	NE	NE	36	16	48	38.00	17.00	85.00	Grapes, fruit trees, lawn wind break and pasture
38.	22746	Cert.	Morris DeLee Trust	NW	SE	19	16	49	40.00	31.25		Alfalfa
				NE	SE				40.00	31.25		
				SW	SE				40.00	31.25		
				SE	SE				40.00	31.25		
				TOTAL					160.00	125.00	625.00	
39.	22941	Cert.	Donnell	SW	NE	18	16	49	0.70	QM	0.00	
40.	23797	Cert.	G. Vassar	NE	SW	10	16	48	40.00	0.00		
				SE	SW				40.00	0.00		
				TOTAL					80.00	0.00	0.00	
41.	24585	Cert.	K. Garey	SE	SW	9	16	49	23.75	23.00	115.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
42. 24725	Cert.	E. McCarthy	NE	NW	18	16	48	37.76	37.76 ✓		
			SE	NW				39.24	30.00 ✓		
			NW	NE				38.79	38.79 ✓		
			SW	NE				39.70	25.00		
			TOTAL					155.49	131.55	657.75	Alfalfa
43. 24729	Cert.	C. Haycock	NE	SE	9	17	49	25.00	0.00		
			NW	SE				25.00	0.00		
			TOTAL					50.00	0.00	0.00	
44. 24763	Cert.	W. Ellis	NE	NE	8	16	49	17.94	6.00	27.50	Wind Break, Trees and Grapes 1.0 Acre @ 2.5 Ac-ft/Ac. for windbreak. 2.4 Acres supplemented by #29069. See #26718 & 29069 for pumpage.
								6.2	2.		
								24.14	8		
45. 25099	Cert.	V. Hill	NW	SW	10	16	48	3.50	3.50	17.50	Pasture
46. 25636	Cert.	A. Sasse	NW	SE	5	16	49	18.00	0.00	0.00	Trees under domestic use.
47. 25742	Cert.	V. Hill	NW	SW	10	16	48	3.50	3.50	17.50	Catfish farm
48. 25743	Cert.	V. Hill	NW	SW	10	16	48	4.50	3.00	15.00	Home, lawn, pasture and trees

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
49.	25744	Cert.	V. Hill	NW	SW	10	16	48	4.50	0.00	0.00	Domestic use
50.	26152	Cert.	David Delaney	SE	SE	8	16	48	40.00	18.50	50.00	See sheet for duties
51.	52616	Permit	Ralph McCraken									
52.	26283	Cert.	Stewart Equipment	NW	NW	18	16	48	40.00	40.00	50.00	
				NW	SW				40.00	0.00	0.00	
				NE	SW				40.00	0.00	0.00	
				NW	SW				40.00	40.00	200.00	
				TOTAL					160.00	80.00	250.00	
53.	26673	Cert.	Desert Farm, Inc.			13	15	49	234.80	QM	10.00	See Inventory sheet
	40448					24						
					N2	25						
						18	15	50				
						19						
					N2	30						
54.	26718	Cert.	G. Eastman	NE	NE	8	16	49	6.20	2.00	5.00	Garden, Wind Break Around
	29069	Cert.										@ 2.5 Ac-Ft/Ac also domestic
55.	27812	Cert.	IMV	NW	NW	28	17	48				
	29451	Cert.		SW	NW							
	29452	Cert.		SE	NE	29			237.00	MM	251.00	Meter readings supplied by IMV

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
56.	28062	Permit	Embry	SW	SE	2	18	49	172.00	QM	50.20	2 - Commercial businesses
	45061	Permit		SE	SW							32 - Various other users
				SW	SW							
				NW	NE	11						
				NE	NW							
57.	28777	Cert.	Welch	SE	NW	2	17	49	8.50	QM	0.00	Vacant
58.	28828	Cert.	Strickland & Pfister	SE	NW	35	16	49	4.02	4.02		Domestic, wind break and
				SW	NE				9.12	9.12		pistachio trees @ 2.0 Ac-Ft/Ac.
				TOTAL					13.14	13.14	26.28	
59.	29521	Cert.	K. Garey	SE	SW	9	16	49	5.00	5.00	25.00	
60.	30411	Cert.	J. Owens	NW	SE	23	16	48	31.00	31.25		
				NE	SE				40.00	31.25		
				SW	SE				40.00	31.25		
				SE	SE				40.00	31.25		
				TOTAL					151.00	125.00	625.00	Full Pivot of alfalfa
61.	31204	Cert.	E. Strunk	NW	NE	8	16	49	4.56	0.00	0.00	
62.	31727	Cert.	K. Garey	SE	SW	9	16	49	5.00	5.00	25.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
63.	32279	Cert.	Anaconda	NE	NW	25	18	50	0.60	CM	0.60	Mining Zeolite
				NW	NE							
64.	35592	Permit	Amargosa Water Corp.		SW	1	17	48	9.50	QM	6.50	12 mobile homes, 1 house
65.	36584	Cert.	R. Allison	NW	NW	15	16	48	2.50	2.50	6.25	Fruit trees, garden & wind break @ 2.5 Ac-Ft/Ac
66.	38127	Cert.	M. Vassar	NW	NW	26	16	48	29.17	29.17		
				NE	NW				29.17	29.17		
				SW	NW				29.17	29.17		
				SE	NW				29.16	29.16		
									116.67	116.67	583.35	
67.	38363	Cert.	M. Vassar	NW	NE	26	16	48	29.17	29.17		Winter crop @2.0 Ac-Ft/Ac
				NE	NE				29.17	29.17		
				SW	NE				29.17	29.17		
				SE	NE				29.16	29.16		
									116.67	116.67	233.34	
68.	40954	Cert.	R. Kerley	SE	SE	22	16	49	3.74	0.75		
				SE	SW				5.80	0.25		
				TOTAL					9.54	1.00	5.00	

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
69.	42171	Permit	R. McCracken	SW	SE	8	16	48	30.00	3.00	7.50	3.0 Acres @ 2.5 Ac-ft/Ac
70.	43524	Cert.	S. Wall	NW	NW	10	17	49	31.40	31.40		
				NE					31.40	31.40		
				SW					31.40	31.40		
				SE					31.40	31.40		
									125.60	125.60	628.00	
71.	43873	Permit	M. Vassar	NW	NW	24	16	48	29.17	29.17		
				NE					29.17	29.17		
				SW					29.17	29.17		
				SE					29.16	29.16		
									116.67	116.67	545.38	Duty limited to 545.38 Ac-Ft
72.	45162	Cert.	MountainView Homes	SE	SW	2	17	49	9.80	QM	3.40	30 - unit motel
	45163	Cert.										08 - unit apartment complex
												06 - unit business complex
												01 - laundromat
73.	45740	Cert.	Fishel	NE	NW	27	16	49	3.40	QM	3.40	1 - home, 2 - mobile homes
74.	46218	Cert.	Bell Telephone	NE	NE	14	16	49	0.08	CM	0.10	Switching station

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
75.	46748	Cert.	J. Strickland	NW	NW	15	16	48	4.13	2.00		Pasture @ 5 ac-ft/ac
				SW	NW				4.29	0.00		
				TOTAL					8.42	2.00	10.00	
76.	47205	Permit	Martinez	SW	SE	31	16	49	37.00	QM	10.50	21 Trailers on 19 lots @ .5 ac-ft per trailer
	47223	Permit										
77.	48479	Cert.	American Borate		SW	36	17	49	567.80	MM	666.44	127.26 Ac-Ft Nevada 539.18 Ac-Ft California
	48480	Cert.										
	48481	Cert.										
	48482	Cert.										
	48483	Cert.										
78.	49220	Cert.	J. Burke	NE	NE	28	16	49	14.70	14.70 ✓	73.50	Anvil Ranch
79.	49804	Permit	Howard	SE	SE	26	16	49	0.10	QM	0.10	Post Office
80.	49885	Cert.	Dave Rau	SE	NW	12	17	48	13.00	13.00	65.00	CF 15881
81.	50385	Permit	Nye County	NW	NE	16	16	49	32.50	QM	30.50	Baseball field, park and windbreak

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE		USED (A/F)	REMARKS
82.	51841	Permit	Barrick Bullfrog				12	46	1500.00				
	51842	Permit					12	47					
	51843						13	46					
	51844												
	51845												
	51846												
	51847												
	51848												
	58268												
	61412								614.00				
	61413												
				TOTAL					2114.00		MM	1589.00	Credit given for injection
83.	51879	Permit	Desert Enterprises	SW	NE	25	12	46	431.90		QM	5.00	2-Mobile homes, 80+/- trees
	51880			SE	NE								
				NW	SE								
				NE	SE								
				SW	NW	30	12	46					
				SE	NW								
				NE	NW								
84.	51915	Permit	Records	SE	SE	26	16	49	9.70		CM	0.00	Property vacant

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE		USED (A/F)	REMARKS
82.	51841	Permit	Barrick Bullfrog				12	46	1500.00				
	51842	Permit					12	47					
	51843						13	46					
	51844												
	51845												
	51846												
	51847												
	51848												
	58268												
	61412												
	61413								614.00				
				TOTAL					2114.00		MM	1589.00	Credit given for injection
83.	51879	Permit	Desert Enterprises	SW	NE	25	12	46	431.90		QM	5.00	2-Mobile homes, 80+/- trees
	51880			SE	NE								
				NW	SE								
				NE	SE								
				SW	NW	30	12	46					
				SE	NW								
				NE	NW								
84.	51915	Permit	Records	SE	SE	26	16	49	9.70		CM	0.00	Property vacant

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
85.	53181	Permit	Marsh	SW	SW	2	18	49	100.00	QM	52.50	Casino and RV park
	53182	Permit		SE	SW							
86.	53189	Permit	Selbach	SE	NE	16	16	48	75.00	CM	2.00	1 - laundromat, 1 - home & 1 - mobile home
87.	53596	Permit	U.S. Fish & Wildlife	NE	SW	7	18	51	297.70	WL	0.00	Well capped
88.	54271	Cert.	Nye County	SE	NE	7	17	52	1.20	QM	1.20	Park in Crystal
89.	55156	Cert.	William & Avis Kirker	NW	SW	10	16	48	5.00	0.00	0.00	
90.	59180	Permit	VFW Post	LT2	SE	35	16	49	5.00	CM	2.50	
91.	60162	Permit	Mathewson	NW	NW	15	16	48	2.50	1.00	4.00	CF-17657
92.	60233	Permit	Young-Robert	SE	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
93.	60386	Permit	Williams	SW	NW	15	16	48	10.00	0.00	0.00	CF-17657 Domestic use
94.	60431	Permit	Johnston	SW	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
95.	60433	Permit	Fowler Sprinklers	NW	NW	15	16	48	2.50	2.50	10.00	CF-17657

16 40

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
96.	60434	Permit	Fowler	SW	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
97.	60435	Permit	Romero	NW	NW	15	16	48	2.50	1.25	5.00	CF-17657
98.	60437	Permit	Allison	NW	NW	15	16	48	2.50	2.50	10.00	CF-17657
99.	60439	Permit	Donaldson	NE	NW	15	16	48	9.08	0.00	0.00	CF-17657 Domestic use
100.	60440	Permit	Silverstein	NE	NW	15	16	48	1.27	0.00	0.00	CF-17657 Domestic use
101.	60442	Permit	Quirk	NE	NW	15	16	48	1.50	0.00	5.00	CF-17657 6+/- trailers store, landscaping
102.	60443	Permit	Dansby	NE	NW	15	16	48	1.27	0.00	0.00	CF-17657 Domestic use
103.	60444	Permit	Strey	NE	NW	15	16	48	4.33	0.00	0.00	CF-17657 Domestic use
104.	60449	Permit	Donaldson	NE	NW	15	16	48	8.67	0.00	0.00	CF-17657 Domestic use
105.	60450	Permit	Allison	NW	NE	15	16	48	1.50	1.00	4.00	CF-36584
106.	60451	Permit	Cady Family Trust	SW	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
107.	60455	Permit	Davis	NW	NW	15	16	48	5.00	2.50	10.00	CF-17657

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
108.	60462	Permit	Potter	SE	NW	15	16	48	2.50	2.00	8.00	CF-17657
109.	60463	Permit	Moen	NW	NW	15	16	48	2.50	2.50	10.00	CF-17657
110.	60464	Permit	Spears	SE	SE	15	16	48	2.50	1.00	4.00	CF-17657
111.	60465	Permit	Ortiz	NW	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
112.	60466	Permit	Williams	SE	NW	15	16	48	2.50	0.50	2.00	CF-17657
113.	60468	Permit	Williams	SW	NW	15	16	48	2.27	0.00	0.00	CF-17657 Domestic use
114.	60469	Permit	Spears	SE	SE	15	16	48	2.50	1.00	4.00	CF-17657
115.	60470	Permit	Rogers	NW	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
116.	60471	Permit	Dolby	NW	NW	15	16	48	1.00	1.00	4.00	CF-36584
117.	60472	Permit	Villalobos	SE	NW	15	16	48	2.50	1.00	4.00	CF-17657
118.	60473	Permit	Selbach	NE	NW	15	16	48	1.60	0.00	0.00	CF-17657 Domestic use
119.	60474	Permit	Church of Amargosa	NE	NW	15	16	48	1.27	0.00	1.00	CF-17657 - Church

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

	NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
120.	60475	Permit	Rogers	NW	NW	15	16	48	2.50	0.00	0.00	CF-17657 Domestic use
121.	60479	Permit	Vassar	Sw	NW	15	16	48	2.50	0.00	0.00	CF-17657
122.	60480	Permit	Kirby	SE	NW	15	16	48	10.00	0.00	0.00	CF-17657 Domestic use
123.	61080	Permit	Rockview Dairies	NW SW	NE NE	10	17	49	50.00	CM	397.30	CF-29649, Commercial
124.	61205	Permit	Bray	SW NW	NE SE	32	16	49	17.20 10.70 27.90	0.00	0.00	CF-17340
125.	61219	Permit	U.S. Fish & Wildlife	SW SE	NE NW	3	18	50	2.20	QM	0.40	Refugee head quarters and 2 mobile homes
										TOTAL	12,434.34	Permitted Rights

GROUND WATER PUMPAGE INVENTORY
AMARGOSA VALLEY, NO. 230
1997

NUMBER	STATUS	OWNER OF RECORD	PLACE OF USE 1/4	1/4	S	T	R	ACRES OR DUTY	ACRES IRR OR USE	USED (A/F)	REMARKS
126.	No Permit		NE	SE	12	17	48		25.00 ✓	50.00	Fruit Trees and Pasture at 2.0 Ac/Ft/Ac
127.	No Permit		NE	SW	9	17	49		0.00	0.00	South of Sod Farm
128.	No Permit		NW	SW	9	17	49		40.00 ✓	200.00	South of Sod Farm
129.	No Permit		SE	SW	9	17	49		30.00 ✓	150.00	South of Sod Farm
130.	No Permit	Dairy	SW	NE	9	17	49		8.00	40.00	
131.	No Permit	Dairy	SE	NE	9	17	49		8.00	40.00	
132.	No Permit	De Lee Trust		NW	25	16	48		125.00	625.00	Full Pivot, Application pending
									TOTAL	1,105.00	Non-permitted rights

Verified with field notes [signature] 3-26-98

Lorraine Garcia

04/12/99 07:34 AM

To: Nicholas Patti/YM/RWDOE@CRWMS
cc: Robert Kimble/YM/RWDOE@CRWMS, Linda Roe/YM/RWDOE@CRWMS

Subject: Enclosures to 1990 Census and Ground Water Pumpage

Nick,

This is to inform you that the information handwritten on the enclosures to Letter Numbers LV.ESR.RLK.03/99-042 and -043 has no affect on the technical content of the record submitted to the RPC. The notes are superfluous and do not indicate a change to the original data.

If you need further clarification, please contact me.

Thank you,

Lorrie Garcia

ATTACHMENT III

1990 CENSUS DATA
(Bureau Of Census 1990)

ATTACHMENT III

1990 CENSUS DATA

The census data presented on the following pages has been limited to only those data that are used in this analyses presented in the body of the document. The data were obtained by requesting the output for the following parameters from the 1990 Census Summary Tape File 3 (STF3) Sample count – all socioeconomic and demographic variables – STF3A Detailed geography - county, place, tract, etc.

P1 Persons (1)
P5 Households (1)
P13 Age (31)
P16 Persons in Household (7)
P77 Industry (17)
P92 Farm Self-employed Income in 1989 (2)

1990 US Census Data

Database: C90STF3A

Summary Level: State--County--County Subdivision

Amargosa Valley division: FIPS.STATE=32, FIPS.COUNTY90=023, FIPS.COUSUB90=94028

PERSONS
Universe: Persons

Total	724

HOUSEHOLDS
Universe: Households

Total	236

AGE
Universe: Persons

Under 1 year	8
1 and 2 years	26
3 and 4 years	9
5 years	9
6 years	0
7 to 9 years	34
10 and 11 years	48
12 and 13 years	48
14 years	26
15 years	27
16 years	9
17 years	18
18 years	0
19 years	27
20 years	27
21 years	0
22 to 24 years	0
25 to 29 years	43
30 to 34 years	62
35 to 39 years	84
40 to 44 years	43
45 to 49 years	81
50 to 54 years	60
55 to 59 years	27
60 and 61 years	0
62 to 64 years	0
65 to 69 years	0
70 to 74 years	0
75 to 79 years	8
80 to 84 years	0
85 years and over	0

PERSONS IN HOUSEHOLD
Universe: Households
1 person....39
2 persons....79
3 persons....27
4 persons....48
5 persons....16
6 persons....18
7 or more persons....9

INDUSTRY
Universe: Employed persons 16 years and over
Agriculture, forestry, and fisheries (000-039)....9
Mining (040-059)....130
Construction (060-099)....25
Manufacturing, nondurable goods (100-229)....8
Manufacturing, durable goods (230-399)....25
Transportation (400-439)....0
Communications and other public utilities (440-499)....9
Wholesale trade (500-579)....0
Retail trade (580-699)....41
Finance, insurance, and real estate (700-720)....9
Business and repair services (721-760)....9
Personal services (761-799)....17
Entertainment and recreation services (800-811)....9
Professional and related services (812-899):
  Health services (812-840)....0
  Educational services (842-860)....35
  Other professional and related services (841, 861-899)....0
Public administration (900-939)....17

FARM SELF-EMPLOYMENT INCOME IN 1989
Universe: Households
With farm self-employment income....9
No farm self-employment income....227

ATTACHMENT IV

SPREADSHEET SHOWING ANALYSIS OF AGE DISTIBUTION FROM 1990 CENSUS DATA

AND

ANALYSIS OF HOUSEHOLD SIZE DISTRIBUTION FROM 1990 CENSUS DATA (Bureau of Census 1990)

Distribution by Age

AGE	Number	
Under 1 year	8	
1 & 2 years	26	
3 & 4 years	9	
5 years	9	
6 years	0	
7 to 9 years	34	
10 & 11 years	48	
12 & 13 years	48	
14 years	26	
15 years	27	
16 years	9	
17 years	18	262 Total 17 & younger
18 years	0	
19 years	27	
20 years	27	
21 years	0	
22 to 24 years	0	
25 to 29 years	43	
30 to 34 years	62	
35 to 39 years	84	
40 to 44 years	43	
45 to 49 years	81	
50 to 54 years	60	
55 to 59 years	27	
60 & 61 years	0	
62 to 64 years	0	
65 to 69 years	0	
70 to 74 years	0	
75 to 79 years	8	
80 to 85 years	0	
85 years and over	0	462 Total 18 & older
Total	724	

Households (HH) by Size

Persons in HH	# HH	# people	Square of Difference
1	39	39	164.71
2	79	158	87.94
3	27	81	0.08
4	48	192	42.86
5	16	80	60.52
6	18	108	156.11
7 or more	9	63	140.06
Totals	236	721	652.28

Mean	SD
3.06	1.67

	# HH per 100 people	
	32.73	
	9.53	
If we had 32.73 households then the 95% CI on people would be	18.68	people
This translates into an uncertainty at the 95% CI of	6.12	households

Lower Limit on Number of Households	26.62
Upper Limit on Number of Households	38.85

ATTACHMENT V

SPREADSHEET
ANALYSIS OF WATER USAGE
FARMS NOT CONSOLIDATED

Groundwater Pumpage Inventory
Amargosa Valley, No. 230
1997
MOL.19990329.0141 **Year 1997**

KEY

Col	Description
A	Sequential ID number record in document.
B	"D" if user is noted as "Dairy"
C	Owner of Record
D	Permit number for groundwater use
E	Second (and subsequent) permit(s) number if appliciable. May have to refer to source document for details of multiple permits
F	Total land area covered by permit(s) (acres)
G	Land area under irrigation in 1997 (acres)
H	Ground water used in 1997 (acre-feet)
I	Derived data (G/F) of annual irrigation depth (used as check on data entered in in Cols G and F).
J	Reported land use (if given)
K	Not used
L	Section
M	Township
N	Range

ID Number	D if Identified as Dairy	Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft	Ft	Reported Usage if any	Section	Township	Range
1		Heisler	13574			DO M	3.2	n/a		9	12	46
2		A. Bettles	14054		25.4	0	0	n/a		12	17	48
3		Florida Corp	14059	27813	142.8	0	0	n/a		1	17	48
4		J. Guynes	14078		39.4	0	0	n/a		15	16	48
5		De Lee Trust	15410		160	0	0	n/a		25	16	48
6		A. Scott	15702		35	35	175	5	Pivot	14	16	48
7		Mathew & Fox	15881	49947	56.38	0	0	n/a		10	16	48
8		J. Owens	15893		160	125	625	5		23	16	48
9	D	Amargosa Farms	15929	17241	160	140	700	5		9	17	49
10	D	Rockview Dairies	15929	29649	124.2	34	170	5		9	17	49
11		H. Hughe	16047		4	0	0	n/a		9	16	49
12		C. Defir	16168		40	0	0	n/a		8	16	48
13		J. Burke	16545		21.98	21.98	109.9	5		28	16	49
14		E. Selbach	16562		105	62.5	312.5	5		16	16	48
15		C. Barr	17137		10	0	0	n/a		36	16	48
16		L. Lowe	17348		15	0	0	n/a		14	16	49
17		De Lee Trust	17404		160	0	0	n/a		25	16	48

18		J. Overholser	17417		45.82	0	0	n/a		17	16	48
19		L. Dansby	17657		30.2	1	4	4	Domestic, lawn & fruit trees			
20		H. Jackson	17657		5	0	0	n/a		15	16	48
21		A. Cameron	17657		2.5	2	8	4	Mob Homes, trees windbreak	15	16	48
22		J & R Development	17694		19	5	25	5	grapes windbreak	15	17	49
23		De Lee Trust	18222		268.5	133	665	5		30	16	49
24		Rehers & Schultz	18764	26442	71.4	4.5	19.5	4.333333		8	16	48
25		C. Holtz	18772		159	9.5	23.75	2.5	fruit trees, wind break	20, 19	16	48
26		Drury & Murdock	19034	21584	100	0	0	n/a		8	17	49
27		F. Cypert	19197		12.5	0	0	n/a		22	16	49
28		B. Barrackman	19448		37	37	92.5	2.5	pistachio some grass	7	16	48
29		De Lee Trust	19916		160	44	110	2.5	fruit trees, wind break, row crops	24	16	48
30		De Lee Trust	19917	22761	160	125	625	5	full pivot	24	16	48
31		Bradshaw & Strickland	20162		30	0	0	n/a		35	16	49
32		H. Watson	20352		233.9	172.9	864.5	5	alfalfa	1, 36	17, 16	48
33		O. Welch	20355		3.2	0	0	n/a		2	17	49
34		D. Barnett	20411		26.4	0	0	n/a	Domestic - no meter	8	16	49
35		Clark & Paterson	22140		8	2	10	5	Crystal	8	17	52
36		Clark & Paterson	22141		21.2	0	0	n/a	Crystal	7	17	52
37		T. Smith	22233		38	17	85	5	grapes, fruit trees, lawn, windbreak, past	36	16	48
38		De Lee Trust	22746		160	125	625	5	alfalfa	19	16	49
39		Donnell	22941		0.7 QM		0	n/a		18	16	49
40		G. Vassar	23797		80	0	0	n/a		10	16	48
41		K. Garey	24585		23.75	23	115	5		9	16	49
42		E. McCarthy	24725		155.49	131.55	657.75	5	alfalfa	18	16	48
43		C. Hatcock	24729		50	0	0	n/a		9	17	49
44		W. Ellis	24763		17.94	6	27.5	4.583333	wind break, trees, grapes	8	16	49
45		V. Hill	25099		3.5	3.5	17.5	5	pasture	10	16	48
46		A. Sasse	25636		18	0	0	n/a		5	16	49
47		V. Hill	25742		3.5	3.5	17.5	5	cat fish	10	16	48
48		V. Hill	25743		4.5	3	15	5	home lawn pasture, trees	10	16	48
49		V. Hill	25744		4.5	0	0	n/a	domestic use	10	16	48
50		R. McCraken/D. Delaney	26152	52616	40	18.5	50	2.702703		8	16	48
52		Stewart Equipment	26283		160	80	250	3.125		18	16	48
53	D	Desert Farms	26673	40448	234.8 QM		10	n/a		various	15	49/50
54		G. Eastman	26718	29069	6.2	2	5	2.5	garden, wind breakand domestic	8	16	49
55		IMV	27812	29451/2	237 MM		251	n/a	meter reading from IMV	28/29	17	48
56		Embry	28062	45061	172 QM		50.2	n/a	2 Commercial & 32 other users	2/11	18	49
57		Welsh	28777		8.5 QM		0	n/a	Vacant	2	17	49
58		Strickland & Plister	28828		13.14	13.14	26.28	2	pistachio, wind break	35	16	49
59		K. Garey	29521		5	5	25	5		9	16	49
60		J. Owens	30411		151	125	625	5	full pivot of alfalfa	23	16	48
61		E. Strunk	31204		4.56	0	0	n/a		8	16	49
62		K. Garey	31727		5	5	25	5		9	16	49
63		Anaconda	32279		0.6 CM		0.6	n/a	Mining Zeolite	25	18	50
64		Amargosa Water Corp	35592		9.5 QM		6.5	n/a	12 mobilas I house	1	17	48

65	R. Allison	36584		2.5	2.5	6.25	2.5	fruit trees, garden, wind break	15	16	48
66	M. Vasser	38127		166.67	166.67	583.35	3.50003		26	16	48
67	M. Vasser	38363		166.67	166.67	233.34	1.400012	winter crop	26	16	48
68	R. Kerley	40954		9.54	1	5	5		22	16	49
69	R. McCracken	42171		30	3	7.5	2.5		8	16	48
70	S. Wall	43524		125.6	125.6	628	5		10	17	49
71	M. Vasser	43873		116.67	116.67	545.38	4.674552		24	16	48
72	Mountain View Homes	45162	45163	9.8	QM	3.4	n/a	motel, apt complex, business complex, h	2	17	49
73	Fishel	45740		3.4	QM	3.4	n/a	home, mobiles	27	16	49
74	Bell Telephone	46218		0.08	CM	0.1	n/a	switching station	14	16	49
75	J. Strickland	46748		8.42	2	10	5	pasture	15	16	48
76	Martinez	47205	47223	37	QM	10.5	n/a	21 trailer on 19 lots	15	16	48
77	American Borate	48479	48480/1/2/3	567.8	MM	666.44	n/a	CA & NV	36	17	49
78	J. Burke	49220		14.7	14.7	73.5	5	Anvil Ranch	28	16	49
79	Howard	49804		0.1	QM	0.1	n/a	Post Office	26	16	49
80	D. Rau	49885		13	13	65	5		12	17	48
81	Nye County	50385		32.5	QM	30.5	n/a	Baseball field, park, windbreak	16	16	49
82	Barrick Bullfrog	51841	multiple	2114	MM	1589	n/a	Credit for injection		12/13	46/47
83	Desert Enterproses	51879	51880	431.9	QM	5	n/a	2 mobiles, 80+/- trees	25/30	12	46
84	Records	51915		9.7	CM	0	n/a	vacent	26	16	49
85	Marsh	53181	53182	100	QM	52.5	n/a	Casino & RV park	2	18	49
86	Selbach	53189		75	CM	2	n/a	laundromat, home, mobile	16	16	48
87	U. S. Fish & Wildlife	53596		297.7	WLM	0	n/a	well capped	7	18	51
88	Nye County	54271		1.2	QM	1.2	n/a	park in Crystal	7	17	52
89	W & A Kircher	55156		5	0	0	n/a		10	16	48
90	VFW Post	59160		5	CM	2.5	n/a		35	16	49
91	Mathewson	60162		2.5	1	4	4		15	16	48
92	Young-Robert	60233		2.5	0	0	n/a		15	16	48
93	Williams	60386		10	0	0	n/a		15	16	48
94	Johnston	60431		2.5	0	0	n/a		15	16	48
95	Fowler	60433		2.5	2.5	10	4		15	16	48
96	Fowler	60434		2.5	0	0	n/a		15	16	48
97	Romero	60435		2.5	1.25	5	4		15	16	48
98	Allison	60437		2.5	2.5	10	4		15	16	48
99	Donaldson	60439		9.08	0	0	n/a		15	16	48
100	Silverstein	60440		1.27	0	0	n/a		15	16	48
101	Quirk	60442		1.5	0	5	n/a	trailers, store, etc	15	16	48
102	Dansby	60443		1.27	0	0	n/a		15	16	48
103	Strey	60444		4.33	0	0	n/a		15	16	48
104	Donaldson	60449		8.67	0	0	n/a		15	16	48
105	Allison	60450		1.5	1	4	4		15	16	48
106	Cady Family Trust	60451		2.5	0	0	n/a		15	16	48
107	Davis	60455		5	2.5	10	4		15	16	48
108	Potter	60462		2.5	2	8	4		15	16	48
109	Moen	60463		2.5	2.5	10	4		15	16	48
110	Spears	60464		2.5	1	4	4		15	16	48

111		Ortiz	60464	2.5	0	0	n/a		15	16	48
112		Williams	60466	2.5	0.5	2	4		15	16	48
113		Williams	60468	2.27	0	0	n/a		15	16	48
114		Spears	60469	2.5	1	4	4		15	16	48
115		Rogers	60470	2.5	0	0	n/a		15	16	48
116		Dolby	60471	1	1	4	4		15	16	48
117		Villalobos	60472	2.5	1	4	4		15	16	48
118		Selbach	60473	1.6	0	0	n/a		15	16	48
119		Church of Amargosa	60474	1.27	0	1	n/a		15	16	48
120		Rogers	60475	2.5	0	0	n/a		15	16	48
121		Vassar	60479	2.5	0	0	n/a		15	16	48
122		Kirby	60480	10	0	0	n/a		15	16	48
123	D	Rockview Dairies	61080	50	50	397.3	7.946		10	17	49
124		Bray	61205	27.9	0	0	n/a		32	16	49
125		U. S. Fish & Wildlife	61219	2.5 QM		0.4	n/a	refuge HQ, 2 mobiles			

Total 12434.34 a-f/y Permitted rights

126		?	No Permit		25	50	2	fruit trees, pasture	12	17	48
127		?	No Permit		0	0			9	17	49
128		?	No Permit		40	200	5		9	17	49
129		?	No Permit		30	150	5		9	17	49
130	D	Dairy	No Permit		8	40	5	Dairy	9	17	49
131	D	Dairy	No Permit		8	40	5	Dairy	9	17	49
132		De Lee Trust	No Permit		125	625	5	Full Pivot Application Pending	25	16	48

Total 1105.00 a-f/y Non-permitted rights

Grand Total 13539.34 a-f/y

The State cover sheet gives the total as 13902 Ac-Ft
The difference, when counting No 13574, gives the 366 Ac-Ft given for "Domestic"
Using our estimates of population/household in 97, we get an average domestic usage very close to the county average.

ID Number	D if Identified as Dairy		Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft	Class	Reported Usage if any	Section	Township	Range		
9	D	D1	Amargosa Farms	15929	17241	160	140	700	1		9	17	49	all	NW
53	D	D3	Desert Farms	26673	40448	234.8 QM		10	1		various	15	49/50		
130	D	D2	Rockview Dairies	No Permit			8	40	1	Dairy	9	17	49	SW	NE
131	D	D2	Rockview Dairies	No Permit			8	40	1	Dairy	9	17	49	SE	NE
123	D	D2	Rockview Dairies	61080		50	50	397.3	1		10	17	49	NW & SW	NE
10	D	D2	Rockview Dairies	15929	29649	124.2	34	170	1		9	17	49	all	NE
128			?1	No Permit			40	200	1		9	17	49		
129			?1	No Permit			30	150	1		9	17	49		
126			?2	No Permit			25	50	1	fruit trees, pasture	12	17	48		
21			A. Cameron	17657		2.5	2	8	1	Mob Homes, trees windbreak	15	16	48		
6			A. Scott	15702		35	35	175	1	Pivot	14	16	48		
98			Allison	60437		2.5	2.5	10	1		15	16	48		
105			Allison	60450		1.5	1	4	1		15	16	48		
28			B. Barrackman	19448		37	37	92.5	1	pistachio some grass	7	16	48		
25			C. Holtz	18772		159	9.5	23.75	1	fruit trees, wind break	20, 19	16	48		
35			Clark & Paterson	22140		8	2	10	1	Crystal	8	17	52		
80			D. Rau	49885		13	13	65	1		12	17	48		
107			Davis	60455		5	2.5	10	1		15	16	48		
23			De Lee Trust	18222		268.5	133	665	1		30	16	49		
30			De Lee Trust	19917	22761	160	125	625	1	full pivot	24	16	48		
38			De Lee Trust	22746		160	125	625	1	alfalfa	19	16	49		
132			De Lee Trust	No Permit			125	625	1	Full Pivot Application Pending	25	16	48		
29			De Lee Trust	19916		160	44	110	1	fruit trees, wind break, row crops	24	16	48		
116			Dolby	60471		1	1	4	1		15	16	48		
42			E. McCarthy	24725		155.49	131.55	657.75	1	alfalfa	18	16	48		
14			E. Selbach	16562		105	62.5	312.5	1		16	16	48		
95			Fowler	60433		2.5	2.5	10	1		15	16	48		
54			G. Eastman	26718	29069	6.2	2	5	1	garden, wind breakand domestic	8	16	49		
32			H. Watson	20352		233.9	172.9	864.5	1	alfalfa	1, 36	17, 16	48		
22			J & R Development	17694		19	5	25	1	grapes windbreak	15	17	49		
13			J. Burke	16545		21.98	21.98	109.9	1		28	16	49		
78			J. Burke	49220		14.7	14.7	73.5	1	Anvil Ranch	28	16	49		
8			J. Owens	15893		160	125	625	1		23	16	48		
60			J. Owens	30411		151	125	625	1	full pivot of alfalfa	23	16	48		
75			J. Strickland	46748		8.42	2	10	1	pasture	15	16	48		
41			K. Garey	24585		23.75	23	115	1		9	16	49		
59			K. Garey	29521		5	5	25	1		9	16	49		
62			K. Garey	31727		5	5	25	1		9	16	49		
19			L. Dansby	17657		30.2	1	4	1	Domestic, lawn & fruit trees					
66			M. Vasser	38127		166.67	166.67	583.35	1		26	16	48		
67			M. Vasser	38363		166.67	166.67	233.34	1	winter crop	26	16	48		
71			M. Vasser	43873		116.67	116.67	545.38	1		24	16	48		
91			Mathewson	60162		2.5	1	4	1		15	16	48		
109			Moen	60463		2.5	2.5	10	1		15	16	48		
108			Potter	60462		2.5	2	8	1		15	16	48		
65			R. Allison	36584		2.5	2.5	6.25	1	fruit trees, garden, wind break	15	16	48		
68			R. Kerley	40954		9.54	1	5	1		22	16	49		
69		Adjacent	R. McCracken	42171		30	3	7.5	1		8	16	48		
50	Adjacent - file under M		R. McCraken	26152	52616	40	18.5	50	1		8	16	48		
24			Rehers & Schultz	18764	26442	71.4	4.5	19.5	1		8	16	48		
97			Romero	60435		2.5	1.25	5	1		15	16	48		
70			S. Wall	43524		125.6	125.6	628	1		10	17	49		

110	Spears	60464		2.5	1	4	1		15	16	48
114	Spears	60469		2.5	1	4	1		15	16	48
52	Stewart Equipment	26283		160	80	250	1		18	16	48
58	Strickland & Pfister	28828		13.14	13.14	26.28	1	pistachio, wind break	35	16	49
37	T. Smith	22233		38	17	85	1	grapes, fruit trees, lawn, windbreak, pastu	36	16	48
47	V. Hill	25742		3.5	3.5	17.5	1	cat fish	10	16	48
45	V. Hill	25099		3.5	3.5	17.5	1	pasture	10	16	48
48	V. Hill	25743		4.5	3	15	1	home lawn pasture, trees	10	16	48
117	Villalobos	60472		2.5	1	4	1		15	16	48
44	W. Ellis	24763		17.94	6	27.5	1	wind break, trees, grapes	8	16	49
112	Williams	60466		2.5	0.5	2	1		15	16	48
						10854.8					
64	Amargosa Water Corp	35592		9.5 QM		6.5	0	12 mobiles f house	1	17	48
74	Bell Telephone	46218		0.08 CM		0.1	0	switching station	14	16	49
119	Church of Amargosa	60474		1.27	0	1	0		15	16	48
83	Desert Enterproses	51879	51880	431.9 QM		5	0	2 mobiles, 80+/- trees	25/30	12	46
56	Embry	28062	45061	172 QM		50.2	0	2 Commercial & 32 other users	2/11	18	49
73	Fishel	45740		3.4 QM		3.4	0	home, mobiles	27	16	49
1	Heisler	13574		DO		3.2	0		9	12	46
79	Howard	49804		0.1 QM		0.1	0	Post Office	26	16	49
85	Marsh	53181	53182	100 QM		52.5	0	Casino & RV park	2	18	49
76	Martinez	47205	47223	37 QM		10.5	0	21 trailer on 19 lots	15	16	48
72	Mountain View Homes	45162	45163	9.8 QM		3.4	0	motel, apt complex, business complex, la	2	17	49
81	Nye County	50385		32.5 QM		30.5	0	Baseball field, park, windbreak	16	16	49
88	Nye County	54271		1.2 QM		1.2	0	park in Crystal	7	17	52
101	Quirk	60442		1.5	0	5	0	trailers, store, etc	15	16	48
86	Selbach	53189		75 CM		2	0	laundromat, home, mobile	16	16	48
90	VFW Post	59180		5 CM		2.5	0		35	16	49
						170.6					
77	American Borate	48479	48480/1/2/	567.8 MM		666.44	-1	CA & NV	36	17	49
63	Anaconda	32279		0.6 CM		0.6	-1	Mining Zeolite	25	18	50
82	Barrick Bullfrog	51841	multiple	2114 MM		1589	-1	Credit for injection		12/13	46/47
55	IMV	27812	29451/2	237 MM		251	-1	meter reading from IMV	28/29	17	48
125	U. S. Fish & Wildlife	61219		2.5 QM		0.4	-1	refuge HQ, 2 mobiles			
						2507.44					
2	A. Bettles	14054		25.4	0	0			12	17	48
3	Florida Corp	14059	27813	142.8	0	0			1	17	48
4	J. Guynes	14078		39.4	0	0			15	16	48
5	De Lee Trust	15410		160	0	0			25	16	48
7	Mathew & Fox	15881	49947	56.38	0	0			10	16	48
11	H. Hughe	16047		4	0	0			9	16	49
12	C. Defir	16168		40	0	0			8	16	48
15	C. Barr	17137		10	0	0			36	16	48
16	L. Lowe	17348		15	0	0			14	16	49
17	De Lee Trust	17404		160	0	0			25	16	48
18	J. Overholser	17417		45.82	0	0			17	16	48
20	H. Jackson	17657		5	0	0			15	16	48
26	Drury & Murdock	19034	21584	100	0	0			8	17	49
27	F. Cypert	19197		12.5	0	0			22	16	49
31	Bradshaw & Strickland	20182		30	0	0			35	16	49
33	O. Welch	20355		3.2	0	0			2	17	49

34		D. Barnett	20411	26.4		0	0	Domestic - no meter	8	16	49
36		Clark & Paterson	22141	21.2		0	0	Crystal	7	17	52
39		Donnell	22941	0.7	QM		0		18	16	49
40		G. Vassar	23797	80		0	0		10	16	48
43		C. Hatcock	24729	50		0	0		9	17	49
46		A. Sasse	25636	18		0	0		5	16	49
49		V. Hill	25744	4.5		0	0	domestic use	10	16	48
57		Welsh	28777	8.5	QM		0	Vacant	2	17	49
61		E. Strunk	31204	4.56		0	0		8	16	49
84		Records	51915	9.7	CM		0	vacent	26	16	49
87		U. S. Fish & Wildlife	53596	297.7	WL		0	well capped	7	18	51
89		W & A Kircher	55156	5		0	0		10	16	48
92		Young-Robert	60233	2.5		0	0		15	16	48
93		Williams	60386	10		0	0		15	16	48
94		Johnston	60431	2.5		0	0		15	16	48
96		Fowler	60434	2.5		0	0		15	16	48
99		Donaldson	60439	9.08		0	0		15	16	48
100		Silverstein	60440	1.27		0	0		15	16	48
102		Dansby	60443	1.27		0	0		15	16	48
103		Strey	60444	4.33		0	0		15	16	48
104		Donaldson	60449	8.67		0	0		15	16	48
106		Cady Family Trust	60451	2.5		0	0		15	16	48
111		Ortiz	60464	2.5		0	0		15	16	48
113		Williams	60468	2.27		0	0		15	16	48
115		Rogers	60470	2.5		0	0		15	16	48
118		Selbach	60473	1.6		0	0		15	16	48
120		Rogers	60475	2.5		0	0		15	16	48
121		Vassar	60479	2.5		0	0		15	16	48
122		Kirby	60480	10		0	0		15	16	48
124		Bray	61205	27.9		0	0		32	16	49
127		?	No Permit			0	0		9	17	49

ID Number	D if Identified as Dairy		Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft
9	D	D1	Amargosa Farms	15929	17241	160	140	700
53	D	D3	Desert Farms	26673	40448	234.8 QM		10
130	D	D2	Rockview Dairies	No Permit			8	40
131	D	D2	Rockview Dairies	No Permit			8	40
123	D	D2	Rockview Dairies	61080		50	50	397.3
10	D	D2	Rockview Dairies	15929	29649	124.2	34	170
128			?1	No Permit			40	200
129			?1	No Permit			30	150
126			?2	No Permit			25	50
21			A. Cameron	17657		2.5	2	8
6			A. Scott	15702		35	35	175
98			Allison	60437		2.5	2.5	10
105			Allison	60450		1.5	1	4
28			B. Barrackman	19448		37	37	92.5
25			C. Holtz	18772		159	9.5	23.75
35			Clark & Paterson	22140		8	2	10
80			D. Rau	49885		13	13	65
107			Davis	60455		5	2.5	10
23			De Lee Trust	18222		268.5	133	665
30			De Lee Trust	19917	22761	160	125	625
38			De Lee Trust	22746		160	125	625
132			De Lee Trust	No Permit			125	625
29			De Lee Trust	19916		160	44	110
116			Dolby	60471		1	1	4
42			E. McCarthy	24725		155.49	131.55	657.75
14			E. Selbach	16562		105	62.5	312.5
95			Fowler	60433		2.5	2.5	10
54			G. Eastman	26718	29069	6.2	2	5
32			H. Watson	20352		233.9	172.9	864.5
22			J & R Development	17694		19	5	25
13			J. Burke	16545		21.98	21.98	109.9
78			J. Burke	49220		14.7	14.7	73.5

8		J. Owens	15893		160	125	625
60		J. Owens	30411		151	125	625
75		J. Strickland	46748		8.42	2	10
41		K. Garey	24585		23.75	23	115
59		K. Garey	29521		5	5	25
62		K. Garey	31727		5	5	25
19		L. Dansby	17657		30.2	1	4
66		M. Vasser	38127		166.67	166.67	583.35
67		M. Vasser	38363		166.67	166.67	233.34
71		M. Vasser	43873		116.67	116.67	545.38
91		Mathewson	60162		2.5	1	4
109		Moen	60463		2.5	2.5	10
108		Potter	60462		2.5	2	8
65		R. Allison	36584		2.5	2.5	6.25
68		R. Kerley	40954		9.54	1	5
69	Adjacent	R. McCracken	42171		30	3	7.5
50	Adjacent - file under M	R. McCraken	26152	52616	40	18.5	50
24		Rehers & Schultz	18764	26442	71.4	4.5	19.5
97		Romero	60435		2.5	1.25	5
70		S. Wall	43524		125.6	125.6	628
110		Spears	60464		2.5	1	4
114		Spears	60469		2.5	1	4
52		Stewart Equipment	26283		160	80	250
58		Strickland & Pfister	28828		13.14	13.14	26.28
37		T. Smith	22233		38	17	85
47		V. Hill	25742		3.5	3.5	17.5
45		V. Hill	25099		3.5	3.5	17.5
48		V. Hill	25743		4.5	3	15
117		Villalobos	60472		2.5	1	4
44		W. Ellis	24763		17.94	6	27.5
112		Williams	60466		2.5	0.5	2
							10854.8

	Owner of Record	Irrigated Acres	Ac*Ft
1	Amargosa Farms	140	700
2	Desert Farms	QM	10
3	Rockview Dairies	8	40
4	Rockview Dairies	8	40
5	Rockview Dairies	50	397.3
6	Rockview Dairies	34	170
7	?1	40	200
8	?1	30	150
9	?2	25	50
10	A. Cameron	2	8
11	A. Scott	35	175
12	Allison	2.5	10
13	Allison	1	4
14	B. Barrackman	37	92.5
15	C. Holtz	9.5	23.75
16	Clark & Paterson	2	10
17	D. Rau	13	65
18	Davis	2.5	10
19	De Lee Trust	133	665
20	De Lee Trust	125	625
21	De Lee Trust	125	625
22	De Lee Trust	125	625
23	De Lee Trust	44	110
24	Dolby	1	4
25	E. McCarthy	131.55	657.75
26	E. Selbach	62.5	312.5
27	Fowler	2.5	10
28	G. Eastman	2	5
29	H. Watson	172.9	864.5
30	J & R Development	5	25
31	J. Burke	21.98	109.9
32	J. Burke	14.7	73.5

Based on Farms currently in AV			Based on Total Households in AV		
C. I.	0.95		C. I.	0.95	
1- C. I.	0.05		1- C. I.	0.05	
Normal Dist CI	1.96		Normal Dist CI	1.96	
Number	112	"farms"	Number	452	"farms"
Mean	96.92	ac-ft/yr	Mean	24.02	ac-ft/yr
S. D.	203.95	ac-ft/yr	S. D.	109.51	ac-ft/yr
Uncertainty	37.77	ac-ft/yr	Uncertainty	10.10	ac-ft/yr
upper	134.69	ac-ft/yr	upper	34.11	ac-ft/yr
expected	96.92	ac-ft/yr	expected	24.02	ac-ft/yr
lower	59.15	ac-ft/yr	lower	13.92	ac-ft/yr
Farms	20		households	32.73	
upper	2693.79	ac-ft/yr	upper	1116.44	ac-ft/yr
expected	1938.36	ac-ft/yr	expected	786.01	ac-ft/yr
lower	1182.93	ac-ft/yr	lower	455.59	ac-ft/yr

33	J. Owens	125	625
34	J. Owens	125	625
35	J. Strickland	2	10
36	K. Garey	23	115
37	K. Garey	5	25
38	K. Garey	5	25
39	L. Dansby	1	4
40	M. Vasser	166.67	583.35
41	M. Vasser	166.67	233.34
42	M. Vasser	116.67	545.38
43	Mathewson	1	4
44	Moen	2.5	10
45	Potter	2	8
46	R. Allison	2.5	6.25
47	R. Kerley	1	5
48	R. McCracken	3	7.5
49	R. McCraken	18.5	50
50	Rehers & Schultz	4.5	19.5
51	Romero	1.25	5
52	S. Wall	125.6	628
53	Spears	1	4
54	Spears	1	4
55	Stewart Equipment	80	250
56	Strickland & Pfister	13.14	26.28
57	T. Smith	17	85
58	V. Hill	3.5	17.5
59	V. Hill	3.5	17.5
60	V. Hill	3	15
61	Villalobos	1	4
62	W. Ellis	6	27.5
63	Williams	0.5	2
64			0
65			0
66			0
67			0

Zero down to SN 452

33	J. Owens	125	625
34	J. Owens	125	625
35	J. Strickland	2	10
36	K. Garey	23	115
37	K. Garey	5	25
38	K. Garey	5	25
39	L. Dansby	1	4
40	M. Vasser	166.67	583.35
41	M. Vasser	166.67	233.34
42	M. Vasser	116.67	545.38
43	Mathewson	1	4
44	Moen	2.5	10
45	Potter	2	8
46	R. Allison	2.5	6.25
47	R. Kerley	1	5
48	R. McCracken	3	7.5
49	R. McCraken	18.5	50
50	Rehers & Schultz	4.5	19.5
51	Romero	1.25	5
52	S. Wall	125.6	628
53	Spears	1	4
54	Spears	1	4
55	Stewart Equipment	80	250
56	Strickland & Pfister	13.14	26.28
57	T. Smith	17	85
58	V. Hill	3.5	17.5
59	V. Hill	3.5	17.5
60	V. Hill	3	15
61	Villalobos	1	4
62	W. Ellis	6	27.5
63	Williams	0.5	2
64			0
65			0
66			0
67			0

Zero down to SN 452

ATTACHMENT VI

SPREADSHEET
ANALYSIS OF WATER USAGE
FARMS CONSOLIDATED

Groundwater Pumpage Inventory
Amargosa Valley, No. 230
1997
MOL.19990329.0141 **Year 1997**

KEY

Col	Description
A	Sequential ID number record in document.
B	"D" if user is noted as "Dairy"
C	Owner of Record
D	Permit number for groundwater use
E	Second (and subsequent) permit(s) number if appliciable. May have to refer to source document for details of multiple permits
F	Total land area covered by permit(s) (acres)
G	Land area under irrigation in 1997 (acres) [For sorting puposes, if this entry was TEXT then an additional M was added to the end of th
H	Ground water used in 1997 (acre-feet)
I	Derived data (G/F) of annual water depth (used as check on data entered in in Cols G and F.
J	Reported land use (if given)
K	Not used
L	Section
M	Township
N	Range

ID Number	D if Identified as Dairy	Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres DO	Irrigated Acres M	Ac*Ft	Ft	Reported Usage if any	Section	Township	Range
1		Heisler	13574					3.2	n/a		9	12	46
2		A. Bettles	14054		25.4		0	0	n/a		12	17	48
3		Florida Corp	14059	27813	142.8		0	0	n/a		1	17	48
4		J. Guynes	14078		39.4		0	0	n/a		15	16	48
5		De Lee Trust	15410		160		0	0	n/a		25	16	48
6		A. Scott	15702		35		35	175	5.00	Pivot	14	16	48
7		Mathew & Fox	15881	49947	56.38		0	0	n/a		10	16	48
8		J. Owens	15893		160		125	625	5.00		23	16	48
9	D	Amargosa Farms	15929	17241	160		140	700	5.00		9	17	49

10	D	Rockview Dairies	15929	29649	124.2	34	170	5.00		9	17	49
11		H. Hughe	16047		4	0	0	n/a		9	16	49
12		C. Defir	16168		40	0	0	n/a		8	16	48
13		J. Burke	16545		21.98	21.98	109.9	5.00		28	16	49
14		E. Selbach	16562		105	62.5	312.5	5.00		16	16	48
15		C. Barr	17137		10	0	0	n/a		36	16	48
16		L. Lowe	17348		15	0	0	n/a		14	16	49
17		De Lee Trust	17404		160	0	0	n/a		25	16	48
18		J. Overholser	17417		45.82	0	0	n/a		17	16	48
19		L. Dansby	17657		30.2	1	4	4.00	Domestic, lawn & fruit trees			
20		H. Jackson	17657		5	0	0	n/a		15	16	48
21		A. Cameron	17657		2.5	2	8	4.00	Mob Homes, trees windbrea	15	16	48
22		J & R Development	17694		19	5	25	5.00	grapes windbreak	15	17	49
23		De Lee Trust	18222		268.5	133	665	5.00		30	16	49
24		Rehers & Schultz	18764	26442	71.4	4.5	19.5	4.33		8	16	48
25		C. Holtz	18772		159	9.5	23.75	2.50	fruit trees, wind break	20, 19	16	48
26		Drury & Murdock	19034	21584	100	0	0	n/a		8	17	49
27		F. Cypert	19197		12.5	0	0	n/a		22	16	49
28		B. Barrackmar	19448		37	37	92.5	2.50	pistachio some grass	7	16	48
29		De Lee Trust	19916		160	44	110	2.50	fruit trees, wind break, row c	24	16	48
30		De Lee Trust	19917	22761	160	125	625	5.00	full pivot	24	16	48
31		Bradshaw & Strickland	20162		30	0	0	n/a		35	16	49
32		H. Watson	20352		233.9	172.9	864.5	5.00	alfalfa	1, 36	17, 16	48
33		O. Welch	20355		3.2	0	0	n/a		2	17	49
34		D. Barnett	20411		26.4	0	0	n/a	Domestic - no meter	8	16	49
35		Clark & Paterson	22140		8	2	10	5.00	Crystal	8	17	52
36		Clark & Paterson	22141		21.2	0	0	n/a	Crystal	7	17	52
37		T. Smith	22233		38	17	85	5.00	grapes, fruit trees, lawn, wir	36	16	48
38		De Lee Trust	22746		160	125	625	5.00	alfalfa	19	16	49
39		Donnell	22941		0.7	QM	0	n/a		18	16	49
40		G. Vassar	23797		80	0	0	n/a		10	16	48
41		K. Garey	24585		23.75	23	115	5.00		9	16	49
42		E. McCarthy	24725		155.49	131.55	657.75	5.00	alfalfa	18	16	48
43		C. Hatcock	24729		50	0	0	n/a		9	17	49
44		W. Ellis	24763		17.94	6	27.5	4.58	wind break, trees, grapes	8	16	49
45		V. Hill	25099		3.5	3.5	17.5	5.00	pasture	10	16	48
46		A. Sasse	25636		18	0	0	n/a		5	16	49
47		V. Hill	25742		3.5	3.5	17.5	5.00	cat fish	10	16	48

48		V. Hill	25743		4.5	3	15	5.00	home lawn pasture, trees	10	16	48
49		V. Hill	25744		4.5	0	0	n/a	domestic use	10	16	48
50		R. McCraken/D. Delaney	26152	52616	40	18.5	50	2.70		8	16	48
52		Stewart Equipment	26283		160	80	250	3.13		18	16	48
53	D	Desert Farms	26673	40448	234.8	QM	10	n/a		various	15	49/50
54		G. Eastman	26718	29069	6.2	2	5	2.50	garden, wind breakand dom	8	16	49
55		IMV	27812	29451/2	237	MM	251	n/a	meter reading from IMV	28/29	17	48
56		Embry	28062	45061	172	QM	50.2	n/a	2 Commercial & 32 other us	2/11	18	49
57		Welsh	28777		8.5	QM	0	n/a	Vacant	2	17	49
58		Strickland & Pfister	28828		13.14	13.14	26.28	2.00	pistachio, wind break	35	16	49
59		K. Garey	29521		5	5	25	5.00		9	16	49
60		J. Owens	30411		151	125	625	5.00	full pivot of alfalfa	23	16	48
61		E. Strunk	31204		4.56	0	0	n/a		8	16	49
62		K. Garey	31727		5	5	25	5.00		9	16	49
63		Anaconda	32279		0.6	CM	0.6	n/a	Mining Zeolite	25	18	50
64		Amargosa Water Corp	35592		9.5	QM	6.5	n/a	12 mobiles I house	1	17	48
65		R. Allison	36584		2.5	2.5	6.25	2.50	fruit trees, garden, wind bre	15	16	48
66		M. Vasser	38127		166.67	166.67	583.35	3.50		26	16	48
67		M. Vasser	38363		166.67	166.67	233.34	1.40	winter crop	26	16	48
68		R. Kerley	40954		9.54	1	5	5.00		22	16	49
69		R. McCracken	42171		30	3	7.5	2.50		8	16	48
70		S. Wall	43524		125.6	125.6	628	5.00		10	17	49
71		M. Vasser	43873		116.67	116.67	545.38	4.67		24	16	48
72		Mountain View Homes	45162	45163	9.8	QM	3.4	n/a	motel, apt complex, busines	2	17	49
73		Fishel	45740		3.4	QM	3.4	n/a	home, mobiles	27	16	49
74		Bell Telephone	46218		0.08	CM	0.1	n/a	switching station	14	16	49
75		J. Strickland	46748		8.42	2	10	5.00	pasture	15	16	48
76		Martinez	47205	47223	37	QM	10.5	n/a	21 trailer on 19 lots	15	16	48
77		American Borate	48479	48480/1/2/	567.8	MM	666.44	n/a	CA & NV	36	17	49
78		J. Burke	49220		14.7	14.7	73.5	5.00	Anvil Ranch	28	16	49
79		Howard	49804		0.1	QM	0.1	n/a	Post Office	26	16	49
80		D. Rau	49885		13	13	65	5.00		12	17	48
81		Nye County	50385		32.5	QM	30.5	n/a	Baseball field, park, windbre	16	16	49
82		Barrick Bullfrog	51841	multiple	2114	MM	1589	n/a	Credit for injection		12/13	46/47
83		Desert Enterproses	51879	51880	431.9	QM	5	n/a	2 mobiles, 80+/- trees	25/30	12	46
84		Records	51915		9.7	CM	0	n/a	vacent	26	16	49
85		Marsh	53181	53182	100	QM	52.5	n/a	Casino & RV park	2	18	49
86		Selbach	53189		75	CM	2	n/a	laundromat, home, mobile	16	16	48

87		U. S. Fish & Wildlife	53596	297.7	WL	M	0	n/a	well capped	7	18	51
88		Nye County	54271	1.2	QM		1.2	n/a	park in Crystal	7	17	52
89		W & A Kircher	55156	5		0	0	n/a		10	16	48
90		VFW Post	59180	5	CM		2.5	n/a		35	16	49
91		Mathewson	60162	2.5		1	4	4.00		15	16	48
92		Young-Robert	60233	2.5		0	0	n/a		15	16	48
93		Williams	60386	10		0	0	n/a		15	16	48
94		Johnston	60431	2.5		0	0	n/a		15	16	48
95		Fowler	60433	2.5		2.5	10	4.00		15	16	48
96		Fowler	60434	2.5		0	0	n/a		15	16	48
97		Romero	60435	2.5		1.25	5	4.00		15	16	48
98		Allison	60437	2.5		2.5	10	4.00		15	16	48
99		Donaldson	60439	9.08		0	0	n/a		15	16	48
100		Silverstein	60440	1.27		0	0	n/a		15	16	48
101		Quirk	60442	1.5		0	5	n/a		15	16	48
102		Dansby	60443	1.27		0	0	n/a		15	16	48
103		Strey	60444	4.33		0	0	n/a		15	16	48
104		Donaldson	60449	8.67		0	0	n/a		15	16	48
105		Allison	60450	1.5		1	4	4.00		15	16	48
106		Cady Family Trust	60451	2.5		0	0	n/a		15	16	48
107		Davis	60455	5		2.5	10	4.00		15	16	48
108		Potter	60462	2.5		2	8	4.00		15	16	48
109		Moen	60463	2.5		2.5	10	4.00		15	16	48
110		Spears	60464	2.5		1	4	4.00		15	16	48
111		Ortiz	60464	2.5		0	0	n/a		15	16	48
112		Williams	60466	2.5		0.5	2	4.00		15	16	48
113		Williams	60468	2.27		0	0	n/a		15	16	48
114		Spears	60469	2.5		1	4	4.00		15	16	48
115		Rogers	60470	2.5		0	0	n/a		15	16	48
116		Dolby	60471	1		1	4	4.00		15	16	48
117		Villalobos	60472	2.5		1	4	4.00		15	16	48
118		Selbach	60473	1.6		0	0	n/a		15	16	48
119		Church of Amargosa	60474	1.27		0	1	n/a		15	16	48
120		Rogers	60475	2.5		0	0	n/a		15	16	48
121		Vassar	60479	2.5		0	0	n/a		15	16	48
122		Kirby	60480	10		0	0	n/a		15	16	48
123	D	Rockview Dairies	61080	50		50	397.3	7.95		10	17	49
124		Bray	61205	27.9		0	0	n/a		32	16	49

125		U. S. Fish & Wildlife	61219	2.5 QM	0.4	n/a refuge HQ, 2 mobiles			

Total 12434.34 a-f/y Permitted rights

126		?	No Permit	25	50	2.00 fruit trees, pasture	12	17	48
127		?	No Permit	0	0		9	17	49
128		?	No Permit	40	200	5.00	9	17	49
129		?	No Permit	30	150	5.00	9	17	49
130	D	Dairy	No Permit	8	40	5.00 Dairy	9	17	49
131	D	Dairy	No Permit	8	40	5.00 Dairy	9	17	49
132		De Lee Trust	No Permit	125	625	5.00 Full Pivot Application Pendit	25	16	48

Total 1105.00 a-f/y Non-permitted rights

Grand Total 13539.34 a-f/y

The State cover sheet gives the total as 13902 Ac-Ft
The difference, when counting No 13574, gives the 366 Ac-Ft given for "Domestic"
Using our estimates of population/household in 97, we get an average domestic usage very close to the county average.

ID No.	D if Identified as Dairy		Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft	Class	Reported Usage if any	Section	Township	Range		
9	D	D1	Amargosa Farms	15929	17241	160	140	700	1		9	17	49	all	NW
53	D	D3	Desert Farms	26673	40448	234.8	QM	10	1		various	15	49/50		
130	D	D2	Rockview Dairies	No Permit			8	40	1	Dairy	9	17	49	SW	NE
131	D	D2	Rockview Dairies	No Permit			8	40	1	Dairy	9	17	49	SE	NE
123	D	D2	Rockview Dairies	61080		50	50	397.3	1		10	17	49	NW & SW	NE
10	D	D2	Rockview Dairies	15929	29649	124.2	34	170	1		9	17	49	all	NE
128			?1	No Permit			40	200	1		9	17	49		
129			?1	No Permit			30	150	1		9	17	49		
126			?2	No Permit			25	50	1	fruit trees, pasture	12	17	48		
21			A. Cameron	17657		2.5	2	8	1	Mob Homes, trees windbreak	15	16	48		
6			A. Scott	15702		35	35	175	1	Pivot	14	16	48		
98			Allison	60437		2.5	2.5	10	1		15	16	48		
105			Allison	60450		1.5	1	4	1		15	16	48		
28			B. Barrackman	19448		37	37	92.5	1	pistachio some grass	7	16	48		
25			C. Holtz	18772		159	9.5	23.75	1	fruit trees, wind break	20, 19	16	48		
35			Clark & Paterson	22140		8	2	10	1	Crystal	8	17	52		
80			D. Rau	49885		13	13	65	1		12	17	48		
107			Davis	60455		5	2.5	10	1		15	16	48		
23			De Lee Trust	18222		268.5	133	665	1		30	16	49		
30			De Lee Trust	19917	22761	160	125	625	1	full pivot	24	16	48		
38			De Lee Trust	22746		160	125	625	1	alfalfa	19	16	49		
132			De Lee Trust	No Permit			125	625	1	Full Pivot Application Pending	25	16	48		
29			De Lee Trust	19916		160	44	110	1	fruit trees, wind break, row crops	24	16	48		
116			Dolby	60471		1	1	4	1		15	16	48		
42			E. McCarthy	24725		155.49	131.55	657.75	1	alfalfa	18	16	48		
14			E. Selbach	16562		105	62.5	312.5	1		16	16	48		
95			Fowler	60433		2.5	2.5	10	1		15	16	48		
54			G. Eastman	26718	29069	6.2	2	5	1	garden, wind breakand domestic	8	16	49		
32			H. Watson	20352		233.9	172.9	864.5	1	alfalfa	1, 36	17, 16	48		
22			J & R Development	17694		19	5	25	1	grapes windbreak	15	17	49		
13			J. Burke	16545		21.98	21.98	109.9	1		28	16	49		
78			J. Burke	49220		14.7	14.7	73.5	1	Anvil Ranch	28	16	49		
8			J. Owens	15893		160	125	625	1		23	16	48		
60			J. Owens	30411		151	125	625	1	full pivot of alfalfa	23	16	48		
75			J. Strickland	46748		8.42	2	10	1	pasture	15	16	48		
41			K. Garey	24585		23.75	23	115	1		9	16	49		
59			K. Garey	29521		5	5	25	1		9	16	49		
62			K. Garey	31727		5	5	25	1		9	16	49		
19			L. Dansby	17657		30.2	1	4	1	Domestic, lawn & fruit trees					
66			M. Vasser	38127		166.67	166.67	583.35	1		26	16	48		
67			M. Vasser	38363		166.67	166.67	233.34	1	winter crop	26	16	48		
71			M. Vasser	43873		116.67	116.67	545.38	1		24	16	48		
91			Mathewson	60162		2.5	1	4	1		15	16	48		
109			Moen	60463		2.5	2.5	10	1		15	16	48		

ID Number	D if Identified as Dairy	Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft		
		De Lee Trust Total				552	2650	Total	1
		M. Vasser Total				450.01	1362.07	Total	1
		J. Owens Total				250	1250	Total	1
		H. Watson Total				172.9	864.5	Total	1
		Amargosa Farms Total				140	700	Total	1
		E. McCarthy Total				131.55	657.75	Total	1
		Rockview Dairies Total				100	647.3	Total	1
		S. Wall Total				125.6	628	Total	1
		?1 Total				70	350	Total	1
		E. Selbach Total				62.5	312.5	Total	1
		Stewart Equipment Total				80	250	Total	1
		J. Burke Total				36.68	183.4	Total	1
		A. Scott Total				35	175	Total	1
		K. Garey Total				33	165	Total	1
		B. Barrackman Total				37	92.5	Total	1
		T. Smith Total				17	85	Total	1
		D. Rau Total				13	65	Total	1
		R. McCracken Total				21.5	57.5	Total	1
		?2 Total				25	50	Total	1
		V. Hill Total				10	50	Total	1
		W. Ellis Total				6	27.5	Total	1
		Strickland & Pfister Total				13.14	26.28	Total	1
		J & R Development Total				5	25	Total	1
		C. Holtz Total				9.5	23.75	Total	1
		Rehers & Schultz Total				4.5	19.5	Total	1
		Allison Total				3.5	14	Total	1
		Desert Farms Total				0	10	Total	1
		Clark & Paterson Total				2	10	Total	1
		Davis Total				2.5	10	Total	1
		Fowler Total				2.5	10	Total	1
		J. Strickland Total				2	10	Total	1
		Moen Total				2.5	10	Total	1
		A. Cameron Total				2	8	Total	1

			Potter Total				2	8	Total	1
			Spears Total				2	8	Total	1
			R. Allison Total				2.5	6.25	Total	1
			G. Eastman Total				2	5	Total	1
			R. Kerley Total				1	5	Total	1
			Romero Total				1.25	5	Total	1
			Dolby Total				1	4	Total	1
			L. Dansby Total				1	4	Total	1
			Mathewson Total				1	4	Total	1
			Villalobos Total				1	4	Total	1
			Williams Total				0.5	2	Total	1
	32		H. Watson	20352		233.9	172.9	864.5	atson	0
	9 D	D1	Amargosa Farms	15929	17241	160	140	700	Farms	0
	23		De Lee Trust	18222		268.5	133	665	Trust	0
	42		E. McCarthy	24725		155.49	131.55	657.75	arthy	0
	70		S. Wall	43524		125.6	125.6	628	Wall	0
	30		De Lee Trust	19917	22761	160	125	625	Trust	0
	38		De Lee Trust	22746		160	125	625	Trust	0
	132		De Lee Trust	No Permit			125	625	Trust	0
	8		J. Owens	15893		160	125	625	Owens	0
	60		J. Owens	30411		151	125	625	Owens	0
	66		M. Vasser	38127		166.67	166.67	583.35	asser	0
	71		M. Vasser	43873		116.67	116.67	545.38	asser	0
	123 D	D2	Rockview Dairies	61080		50	50	397.3	iries	0
	14		E. Selbach	16562		105	62.5	312.5	lbach	0
	52		Stewart Equipment	26283		160	80	250	pment	0
	67		M. Vasser	38363		166.67	166.67	233.34	asser	0
	128		?1	No Permit			40	200	?1	0
	6		A. Scott	15702		35	35	175	Scott	0
	10 D	D2	Rockview Dairies	15929	29649	124.2	34	170	iries	0
	129		?1	No Permit			30	150	?1	0
	41		K. Garey	24585		23.75	23	115	Garey	0
	29		De Lee Trust	19916		160	44	110	Trust	0
	13		J. Burke	16545		21.98	21.98	109.9	Burke	0
	28		B. Barrackman	19448		37	37	92.5	ckman	0

37			T. Smith	22233		38	17	85	Smith	0
78			J. Burke	49220		14.7	14.7	73.5	Burke	0
80			D. Rau	49885		13	13	65	. Rau	0
126			?2	No Permit			25	50	?2	0
50		Adjacent	R. McCracken	26152	52616	40	18.5	50	acken	0
130	D	D2	Rockview Dairies	No Permit			8	40	iries	0
131	D	D2	Rockview Dairies	No Permit			8	40	iries	0
44			W. Ellis	24763		17.94	6	27.5	Ellis	0
58			Strickland & Pfister	28828		13.14	13.14	26.28	ister	0
22			J & R Development	17694		19	5	25	pment	0
59			K. Garey	29521		5	5	25	Garey	0
62			K. Garey	31727		5	5	25	Garey	0
25			C. Holtz	18772		159	9.5	23.75	Holtz	0
24			Rehers & Schultz	18764	26442	71.4	4.5	19.5	hultz	0
47			V. Hill	25742		3.5	3.5	17.5	Hill	0
45			V. Hill	25099		3.5	3.5	17.5	Hill	0
48			V. Hill	25743		4.5	3	15	Hill	0
53	D	D3	Desert Farms	26673	40448	234.8 QM		10	Farms	0
98			Allison	60437		2.5	2.5	10	lison	0
35			Clark & Paterson	22140		8	2	10	erson	0
107			Davis	60455		5	2.5	10	Davis	0
95			Fowler	60433		2.5	2.5	10	owler	0
75			J. Strickland	46748		8.42	2	10	kland	0
109			Moen	60463		2.5	2.5	10	Moen	0
21			A. Cameron	17657		2.5	2	8	meron	0
108			Potter	60462		2.5	2	8	otter	0
69		Adjacent	R. McCracken	42171		30	3	7.5	acken	0
65			R. Allison	36584		2.5	2.5	6.25	lison	0
54			G. Eastman	26718	29069	6.2	2	5	stman	0
68			R. Kerley	40954		9.54	1	5	erley	0
97			Romero	60435		2.5	1.25	5	omero	0
105			Allison	60450		1.5	1	4	lison	0
116			Dolby	60471		1	1	4	Dolby	0
19			L. Dansby	17657		30.2	1	4	ansby	0
91			Mathewson	60162		2.5	1	4	ewson	0
110			Spears	60464		2.5	1	4	pears	0
114			Spears	60469		2.5	1	4	pears	0

117	Villalobos	60472	2.5	1	4	lobos	0
112	Williams	60466	2.5	0.5	2	liams	0

	Owner of Record	Irrigated Acres	Ac*Ft
1	De Lee Trust Total	552	2650
2	M. Vasser Total	450.01	1362.07
3	J. Owens Total	250	1250
4	H. Watson Total	172.9	864.5
5	Amargosa Farms Total	140	700
6	E. McCarthy Total	131.55	657.75
7	Rockview Dairies Total	100	647.3
8	S. Wall Total	125.6	628
9	?1 Total	70	350
10	E. Selbach Total	62.5	312.5
11	Stewart Equipment Total	80	250
12	J. Burke Total	36.68	183.4
13	A. Scott Total	35	175
14	K. Garey Total	33	165
15	B. Barrackman Total	37	92.5
16	T. Smith Total	17	85
17	D. Rau Total	13	65
18	R. McCracken Total	21.5	57.5
19	?2 Total	25	50
20	V. Hill Total	10	50
21	W. Ellis Total	6	27.5
22	Strickland & Pfister Total	13.14	26.28
23	J & R Development Total	5	25
24	C. Holtz Total	9.5	23.75
25	Rehers & Schultz Total	4.5	19.5
26	Allison Total	3.5	14
27	Desert Farms Total	0	10
28	Clark & Paterson Total	2	10
29	Davis Total	2.5	10
30	Fowler Total	2.5	10
31	J. Strickland Total	2	10
32	Moen Total	2.5	10
33	A. Cameron Total	2	8
34	Potter Total	2	8
35	Spears Total	2	8

Based on Farms curently in AV			**Based on Total Households in AV**		
C. I.	0.95		C. I.	0.95	
1- C. I.	0.05		1- C. I.	0.05	
Normal Dist CI	1.96		Normal Dist CI	1.96	
Number	44	"farms"	Number	452	"farms"
Mean	246.7	ac-ft/yr	Mean	24.02	ac-ft/yr
S. D.	497.72	ac-ft/yr	S. D.	170.23	ac-ft/yr
Uncertainty	147.07		Uncertainty	15.69	
Average			**Average**		
upper	393.77		upper	39.71	
expected	246.7		expected	24.02	
lower	99.63		lower	8.32	
Farms	20		Households	32.76	
Totals			**Totals**		
upper	7875.30		upper	1300.85	
expected	4934.00		expected	786.73	
lower	1992.70		lower	272.61	

36	R. Allison Total	2.5	6.25	
37	G. Eastman Total	2	5	
38	R. Kerley Total	1	5	
39	Romero Total	1.25	5	
40	Dolby Total	1	4	
41	L. Dansby Total	1	4	
42	Mathewson Total	1	4	
43	Villalobos Total	1	4	
44	Williams Total	0.5	2	
45			0	
46			0	
47			0	Zeros continue down to 452 (line 457)

4	J. Guynes	14078		39.4	0	0		15	16	48
5	De Lee Trust	15410		160	0	0		25	16	48
7	Mathew & Fox	15881	49947	56.38	0	0		10	16	48
11	H. Hughe	16047		4	0	0		9	16	49
12	C. Defir	16168		40	0	0		8	16	48
15	C. Barr	17137		10	0	0		36	16	48
16	L. Lowe	17348		15	0	0		14	16	49
17	De Lee Trust	17404		160	0	0		25	16	48
18	J. Overholser	17417		45.82	0	0		17	16	48
20	H. Jackson	17657		5	0	0		15	16	48
26	Drury & Murdock	19034	21584	100	0	0		8	17	49
27	F. Cypert	19197		12.5	0	0		22	16	49
31	Bradshaw & Strickland	20162		30	0	0		35	16	49
33	O. Welch	20355		3.2	0	0		2	17	49
34	D. Barnett	20411		26.4	0	0	Domestic - no meter	8	16	49
36	Clark & Paterson	22141		21.2	0	0	Crystal	7	17	52
39	Donnell	22941		0.7 QM		0		18	16	49
40	G. Vassar	23797		80	0	0		10	16	48
43	C. Hatcock	24729		50	0	0		9	17	49
46	A. Sasse	25636		18	0	0		5	16	49
49	V. Hill	25744		4.5	0	0	domestic use	10	16	48
57	Welsh	28777		8.5 QM		0	Vacant	2	17	49
61	E. Strunk	31204		4.56	0	0		8	16	49
84	Records	51915		9.7 CM		0	vacent	26	16	49
87	U. S. Fish & Wildlife	53596		297.7 WL		0	well capped	7	18	51
89	W & A Kircher	55156		5	0	0		10	16	48
92	Young-Robert	60233		2.5	0	0		15	16	48
93	Williams	60386		10	0	0		15	16	48
94	Johnston	60431		2.5	0	0		15	16	48
96	Fowler	60434		2.5	0	0		15	16	48
99	Donaldson	60439		9.08	0	0		15	16	48
100	Silverstein	60440		1.27	0	0		15	16	48
102	Dansby	60443		1.27	0	0		15	16	48
103	Strey	60444		4.33	0	0		15	16	48
104	Donaldson	60449		8.67	0	0		15	16	48
106	Cady Family Trust	60451		2.5	0	0		15	16	48
111	Ortiz	60464		2.5	0	0		15	16	48
113	Williams	60468		2.27	0	0		15	16	48
115	Rogers	60470		2.5	0	0		15	16	48
118	Selbach	60473		1.6	0	0		15	16	48
120	Rogers	60475		2.5	0	0		15	16	48
121	Vassar	60479		2.5	0	0		15	16	48
122	Kirby	60480		10	0	0		15	16	48
124	Bray	61205		27.9	0	0		32	16	49
127	?	No Permit			0	0		9	17	49

ID Number	D if Identified as Dairy		Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft
9	D	D1	Amargosa Farms	15929	17241	160	140	700
			Amargosa Farms Total				140	700
53	D	D3	Desert Farms	26673	40448	234.8 QM		10
			Desert Farms Total				0	10
130	D	D2	Rockview Dairies	No Permit			8	40
131	D	D2	Rockview Dairies	No Permit			8	40
123	D	D2	Rockview Dairies	61080		50	50	397.3
10	D	D2	Rockview Dairies	15929	29649	124.2	34	170
			Rockview Dairies Total				100	647.3
128			?1	No Permit			40	200
129			?1	No Permit			30	150
			?1 Total				70	350
126			?2	No Permit			25	50
			?2 Total				25	50
21			A. Cameron	17657		2.5	2	8
			A. Cameron Total				2	8
6			A. Scott	15702		35	35	175
			A. Scott Total				35	175
98			Allison	60437		2.5	2.5	10
105			Allison	60450		1.5	1	4
			Allison Total				3.5	14
28			B. Barrackman	19448		37	37	92.5
			B. Barrackman Total				37	92.5
25			C. Holtz	18772		159	9.5	23.75
			C. Holtz Total				9.5	23.75
35			Clark & Paterson	22140		8	2	10
			Clark & Paterson Total				2	10
80			D. Rau	49885		13	13	65
			D. Rau Total				13	65
107			Davis	60455		5	2.5	10
			Davis Total				2.5	10
23			De Lee Trust	18222		268.5	133	665
30			De Lee Trust	19917	22761	160	125	625

38	De Lee Trust	22746		160	125	625
132	De Lee Trust	No Permit			125	625
29	De Lee Trust	19916		160	44	110
	De Lee Trust Total				552	2650
116	Dolby	60471		1	1	4
	Dolby Total				1	4
42	E. McCarthy	24725		155.49	131.55	657.75
	E. McCarthy Total				131.55	657.75
14	E. Selbach	16562		105	62.5	312.5
	E. Selbach Total				62.5	312.5
95	Fowler	60433		2.5	2.5	10
	Fowler Total				2.5	10
54	G. Eastman	26718	29069	6.2	2	5
	G. Eastman Total				2	5
32	H. Watson	20352		233.9	172.9	864.5
	H. Watson Total				172.9	864.5
22	J & R Development	17694		19	5	25
	J & R Development Total				5	25
13	J. Burke	16545		21.98	21.98	109.9
78	J. Burke	49220		14.7	14.7	73.5
	J. Burke Total				36.68	183.4
8	J. Owens	15893		160	125	625
60	J. Owens	30411		151	125	625
	J. Owens Total				250	1250
75	J. Strickland	46748		8.42	2	10
	J. Strickland Total				2	10
41	K. Garey	24585		23.75	23	115
59	K. Garey	29521		5	5	25
62	K. Garey	31727		5	5	25
	K. Garey Total				33	165
19	L. Dansby	17657		30.2	1	4
	L. Dansby Total				1	4
66	M. Vasser	38127		166.67	166.67	583.35
67	M. Vasser	38363		166.67	166.67	233.34
71	M. Vasser	43873		116.67	116.67	545.38
	M. Vasser Total				450.01	1362.07
91	Mathewson	60162		2.5	1	4

		Mathewson Total				1	4
109		Moen	60463		2.5	2.5	10
		Moen Total				2.5	10
108		Potter	60462		2.5	2	8
		Potter Total				2	8
65		R. Allison	36584		2.5	2.5	6.25
		R. Allison Total				2.5	6.25
68		R. Kerley	40954		9.54	1	5
		R. Kerley Total				1	5
69	Adjacent	R. McCracken	42171		30	3	7.5
50	Adjacent - file under M	R. McCracken	26152	52616	40	18.5	50
		R. McCracken Total				21.5	57.5
24		Rehers & Schultz	18764	26442	71.4	4.5	19.5
		Rehers & Schultz Total				4.5	19.5
97		Romero	60435		2.5	1.25	5
		Romero Total				1.25	5
70		S. Wall	43524		125.6	125.6	628
		S. Wall Total				125.6	628
110		Spears	60464		2.5	1	4
114		Spears	60469		2.5	1	4
		Spears Total				2	8
52		Stewart Equipment	26283		160	80	250
		Stewart Equipment Total				80	250
58		Strickland & Pfister	28828		13.14	13.14	26.28
		Strickland & Pfister Total				13.14	26.28
37		T. Smith	22233		38	17	85
		T. Smith Total				17	85
47		V. Hill	25742		3.5	3.5	17.5
45		V. Hill	25099		3.5	3.5	17.5
48		V. Hill	25743		4.5	3	15
		V. Hill Total				10	50
117		Villalobos	60472		2.5	1	4
		Villalobos Total				1	4
44		W. Ellis	24763		17.94	6	27.5
		W. Ellis Total				6	27.5
112		Williams	60466		2.5	0.5	2
		Williams Total				0.5	2

Grand Total	2433.13	10854.8

ID No.	D if Identified as Dairy		Owner of Record	First Permit #	Second Permit # if applic.	Total Acres	Irrigated Acres	Ac*Ft		
9	D	D1	Amargosa Farms	15929	17241	160	140	700	Farms	0
			Amargosa Farms Total				140	700	Total	1
53	D	D3	Desert Farms	26673	40448	234.8 QM		10	Farms	0
			Desert Farms Total				0	10	Total	1
130	D	D2	Rockview Dairies	No Permit			8	40	iries	0
131	D	D2	Rockview Dairies	No Permit			8	40	iries	0
123	D	D2	Rockview Dairies	61080		50	50	397.3	iries	0
10	D	D2	Rockview Dairies	15929	29649	124.2	34	170	iries	0
			Rockview Dairies Total				100	647.3	Total	1
128			?1	No Permit			40	200	?1	0
129			?1	No Permit			30	150	?1	0
			?1 Total				70	350	Total	1
126			?2	No Permit			25	50	?2	0
			?2 Total				25	50	Total	1
21			A. Cameron	17657		2.5	2	8	meron	0
			A. Cameron Total				2	8	Total	1
6			A. Scott	15702		35	35	175	Scott	0
			A. Scott Total				35	175	Total	1
98			Allison	60437		2.5	2.5	10	lison	0
105			Allison	60450		1.5	1	4	lison	0
			Allison Total				3.5	14	Total	1
28			B. Barrackman	19448		37	37	92.5	ckman	0
			B. Barrackman Total				37	92.5	Total	1
25			C. Holtz	18772		159	9.5	23.75	Holtz	0
			C. Holtz Total				9.5	23.75	Total	1
35			Clark & Paterson	22140		8	2	10	erson	0
			Clark & Paterson Total				2	10	Total	1
80			D. Rau	49885		13	13	65	. Rau	0
			D. Rau Total				13	65	Total	1
107			Davis	60455		5	2.5	10	Davis	0
			Davis Total				2.5	10	Total	1
23			De Lee Trust	18222		268.5	133	665	Trust	0
30			De Lee Trust	19917	22761	160	125	625	Trust	0

38	De Lee Trust	22746		160	125	625	Trust	0
132	De Lee Trust	No Permit			125	625	Trust	0
29	De Lee Trust	19916		160	44	110	Trust	0
	De Lee Trust Total				552	2650	Total	1
116	Dolby	60471		1	1	4	Dolby	0
	Dolby Total				1	4	Total	1
42	E. McCarthy	24725		155.49	131.55	657.75	arthy	0
	E. McCarthy Total				131.55	657.75	Total	1
14	E. Selbach	16562		105	62.5	312.5	lbach	0
	E. Selbach Total				62.5	312.5	Total	1
95	Fowler	60433		2.5	2.5	10	owler	0
	Fowler Total				2.5	10	Total	1
54	G. Eastman	26718	29069	6.2	2	5	stman	0
	G. Eastman Total				2	5	Total	1
32	H. Watson	20352		233.9	172.9	864.5	atson	0
	H. Watson Total				172.9	864.5	Total	1
22	J & R Development	17694		19	5	25	pment	0
	J & R Development Total				5	25	Total	1
13	J. Burke	16545		21.98	21.98	109.9	Burke	0
78	J. Burke	49220		14.7	14.7	73.5	Burke	0
	J. Burke Total				36.68	183.4	Total	1
8	J. Owens	15893		160	125	625	Owens	0
60	J. Owens	30411		151	125	625	Owens	0
	J. Owens Total				250	1250	Total	1
75	J. Strickland	46748		8.42	2	10	kland	0
	J. Strickland Total				2	10	Total	1
41	K. Garey	24585		23.75	23	115	Garey	0
59	K. Garey	29521		5	5	25	Garey	0
62	K. Garey	31727		5	5	25	Garey	0
	K. Garey Total				33	165	Total	1
19	L. Dansby	17657		30.2	1	4	ansby	0
	L. Dansby Total				1	4	Total	1
66	M. Vasser	38127		166.67	166.67	583.35	asser	0
67	M. Vasser	38363		166.67	166.67	233.34	asser	0
71	M. Vasser	43873		116.67	116.67	545.38	asser	0
	M. Vasser Total				450.01	1362.07	Total	1
91	Mathewson	60162		2.5	1	4	ewson	0

		Mathewson Total				1	4	Total	1
109		Moen	60463		2.5	2.5	10	Moen	0
		Moen Total				2.5	10	Total	1
108		Potter	60462		2.5	2	8	otter	0
		Potter Total				2	8	Total	1
65		R. Allison	36584		2.5	2.5	6.25	lison	0
		R. Allison Total				2.5	6.25	Total	1
68		R. Kerley	40954		9.54	1	5	erley	0
		R. Kerley Total				1	5	Total	1
69	Adjacer	R. McCracken	42171		30	3	7.5	acken	0
50	ljacent - file unde	R. McCracken	26152	52616	40	18.5	50	acken	0
		R. McCracken Total				21.5	57.5	Total	1
24		Rehers & Schultz	18764	26442	71.4	4.5	19.5	hultz	0
		Rehers & Schultz Total				4.5	19.5	Total	1
97		Romero	60435		2.5	1.25	5	omero	0
		Romero Total				1.25	5	Total	1
70		S. Wall	43524		125.6	125.6	628	Wall	0
		S. Wall Total				125.6	628	Total	1
110		Spears	60464		2.5	1	4	pears	0
114		Spears	60469		2.5	1	4	pears	0
		Spears Total				2	8	Total	1
52		Stewart Equipment	26283		160	80	250	pment	0
		Stewart Equipment Total				80	250	Total	1
58		Strickland & Pfister	28828		13.14	13.14	26.28	ister	0
		Strickland & Pfister Total				13.14	26.28	Total	1
37		T. Smith	22233		38	17	85	Smith	0
		T. Smith Total				17	85	Total	1
47		V. Hill	25742		3.5	3.5	17.5	Hill	0
45		V. Hill	25099		3.5	3.5	17.5	Hill	0
48		V. Hill	25743		4.5	3	15	Hill	0
		V. Hill Total				10	50	Total	1
117		Villalobos	60472		2.5	1	4	lobos	0
		Villalobos Total				1	4	Total	1
44		W. Ellis	24763		17.94	6	27.5	Ellis	0
		W. Ellis Total				6	27.5	Total	1
112		Williams	60466		2.5	0.5	2	liams	0
		Williams Total				0.5	2	Total	1

Grand Total	2433.13	10854.8	**Total**	1	